ENGR. LIB.

TWENTY-FIFTH YEAR

The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

Vol. XXV. No. 1.
$2.00 a year. 30 cents a copy.

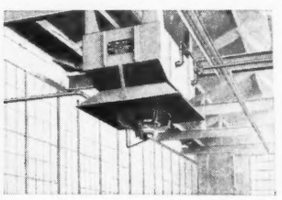
JANUARY, 1928

Heating & Ventilating Magazine Co.
386 Fourth Avenue, New York.

ILLINOIS HEATING SYSTEMS, found in America's finest and foremost buildings, are demonstrating their faultless performance year after year and reflecting credit on the discerning judgment of architects and engineers everywhere.

ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD. PRES. INCORPORATED 1900
BRANCHES AND REPRESENTATIVES IN 40 CITIES
CHICAGO

Have You Emergency Heating Problems to Meet Now?



The Clarage Ceiling Type Heater is up, out of the way, leaving all the floor space for production

PATENTS PENDING

— *then Here is the Equipment You Need!*

WHEN a client or customer calls you in, what do you recommend for helping out a heating system that January weather has proved inadequate? You might well suggest this new Clarage Unit Heater. One or more of these units is just the thing for warming up some cold "spot" or a cold room in any industrial plant—and at very low cost.

New Principle—No Cold Sides

The Clarage Unit Heater is radically different. It distributes warm air in *all* horizontal directions—direct from a positive centrifugal fan. It has no cold sides. The heat circulation is more uniform, more rapid, with heat losses reduced to minimum. The saving in operating cost will run 10 to 25 per cent.

Use Any Boiler Equipment

The Clarage Unit Heater has an all-copper tube, non-leakable heating element, utilizing steam from the present source of supply at any pressure to 50 pounds. Simply connect steam and return lines, wire electric motor, and unit is ready to run. It can be automatically controlled.

Low Priced—Shipped from Stock

The Clarage Unit Heater costs decidedly less than direct radiation of equal capacity. ***And you can install this equipment now***—we ship promptly from stock, either floor or ceiling units as you require.

Solve your emergency heating problems with Clarage Unit Heaters—the modern, profitable way. The coupon below brings complete information, or a Clarage engineer to help you.

CLARAGE FAN COMPANY, Kalamazoo, Michigan

Manufacturers of Heating and Ventilating Equipment since 1912. *Sales Engineering Offices in 25 Cities.*

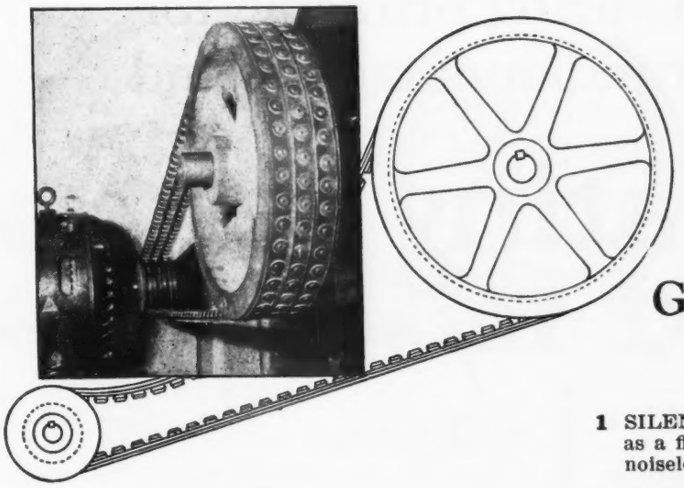
CLARAGE *New* UNIT HEATER

CHECK, SIGN AND MAIL TODAY

☐ Send copy of Catalog 42 on Clarage Unit Heaters. ☐ Without obligation have Clarage engineer call as soon as possible.

Signed..... Company Name.....

Street Address..... City and State.....



ELIMINATE

Noise, Stretch, Slip— Cut running cost on short centers Graton & Knight Leather "V" Belts

1 SILENT—run as quietly as a flat belt—practically noiseless.

2 Positive in action.

3 Made of flexible leather which absorbs the strain of sudden heavy loads and stoppages that ruin ordinary drives quickly.

4 Works best when *slack*, reducing frictional losses to a minimum.

5 Light and clean — runs dry, without grease or oil.

6 Never fray or pulverize—proved themselves, in actual installations, to be the longest wearing short center drives made.

Write for Recommendation or Data.

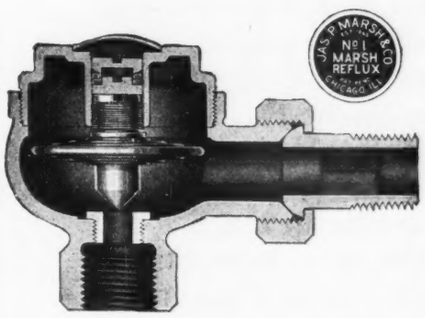
Our Engineering Department is fully equipped and always ready to give you helpful recommendations or data on short center drives.

GRATON & KNIGHT

GRATON & KNIGHT COMPANY
Worcester, Mass.

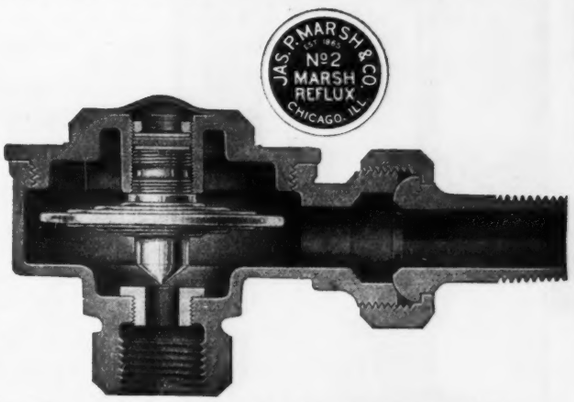
GRATON & KNIGHT
Standardized
LEATHER BELTING LASTS LONGER

MARSH REFLUX THERMOSTATIC RADIATOR TRAPS



GUARANTEE ON EVERY TRAP

If any Marsh Reflux Trap might develop a defect in material, workmanship or operation inside of five years after date of installation, such Trap would be replaced free of charge.



The Most Economical, Practical and Efficient Trap for the Average Sized Unit

Marsh Reflux Traps assure full efficiency of Radiator Coil and System.

Automatically discharge air and the water of condensation as fast as it is formed.

The Trap closes the instant steam or vapor strikes the thermostatic diaphragm. Vapor or steam cannot pass through the Trap; therefore every atom of heat is given off in the radiator or coil.

Just one movable part—nothing loose to rattle, chatter or make a noise.

Neat in appearance, handsomely finished and heavily nickel-plated.

The Economical, Practical and Efficient Trap for Both Small and Large Units

Marsh Reflux Traps are all-metal construction including heavy cast brass body, handsomely nickel-plated and with extra heavy special tail piece.

The one movable part—a genuine phosphor bronze non-collapsible Thermostatic Diaphragm—contains the combination of volatile fluids so balanced as to, at all times, distinguish between air and water of condensation and vapor or steam. So corrugated and constructed to eliminate the slightest possibility of rupture from alternate expansion and contraction.

JAS P. MARSH & CO.

114-124 So. Clinton St. **Chicago**
ESTABLISHED 1865

62 YEARS CONTINUOUS EXPERIENCE IN MANUFACTURE OF STEAM SPECIALTIES

Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents—Indicating and Recording Gauges

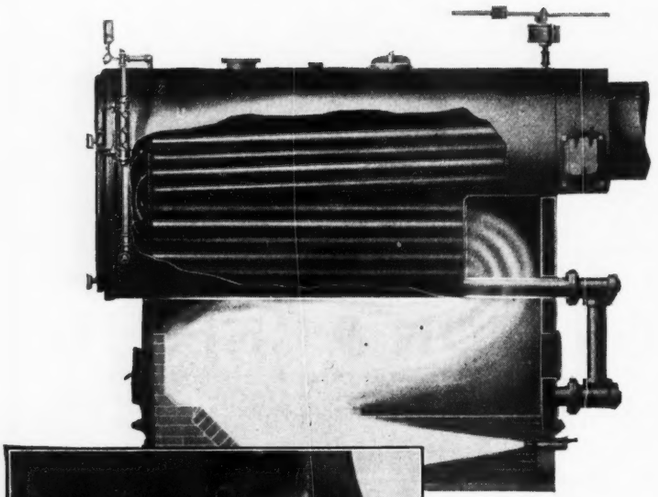
Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario.

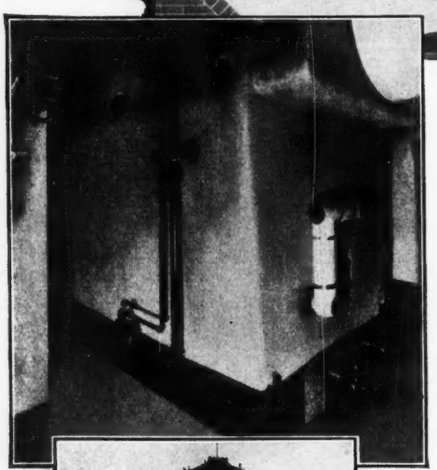
THE HEATING AND VENTILATING MAGAZINE, published monthly by THE HEATING AND VENTILATING MAGAZINE CO., at 386 Fourth Avenue, New York, N. Y. Subscription rates: United States, $2.00; Canada, $2.50; Foreign, $3.00. Single copies, 30 cents. Vol. XXV, No. 1, January, 1928. Entered as second-class matter, April 18, 1925, at the Post-Office at New York, N. Y., under the Act of March 3, 1879.

278122

The Pacific rear-firing principle for oil burning is fundamentally sound

This Operating Test Proved It





Mark Hopkins Hotel, San Francisco. Geo. D. Smith, Managing Director. Weeks & Day, Architects, Leland & Haley, Mechanical Engineers. Heated by two No. 824 14,000 sq. ft. Pacific rear oil-fired boilers, installed by Knittle Bros.

1. *Efficiency* — ranged from 83.05% at 82.8% of rating to 76.91% at 152.4% of rating.

2. *Overload Capacity* — boiler developed 152.4% of rating with high efficiency and no priming.

3. *Dry Steam* — only 0.93% water in separator box at 152.4% of rating.

4. *Low Flue Gas Temperature* —only 603° F. at 152.4% of rating.

One actual operating test by disinterested engineers of standing, is worth any number of factory or laboratory tests. The much-discussed test by Leland & Haley on the Pacific Boilers installed in the Mark Hopkins Hotel, San Francisco, is a case in point. It proves conclusively that the principle of four-time fire travel, found in no other type of boiler, gives most satisfactory results, by whatever standard you measure the success of the installation. Gases travel twice the length of the combustion chamber before entering the lower bank of tubes, then twice the length of the boiler through the tubes. Write for booklet containing complete data on this notable test of Pacific rear oil-fired boilers.

STEEL HEATING BOILERS PACIFIC WAUKEGAN, ILL. BRISTOL TRADE MARK REG. U.S. PAT. OFF.

PACIFIC

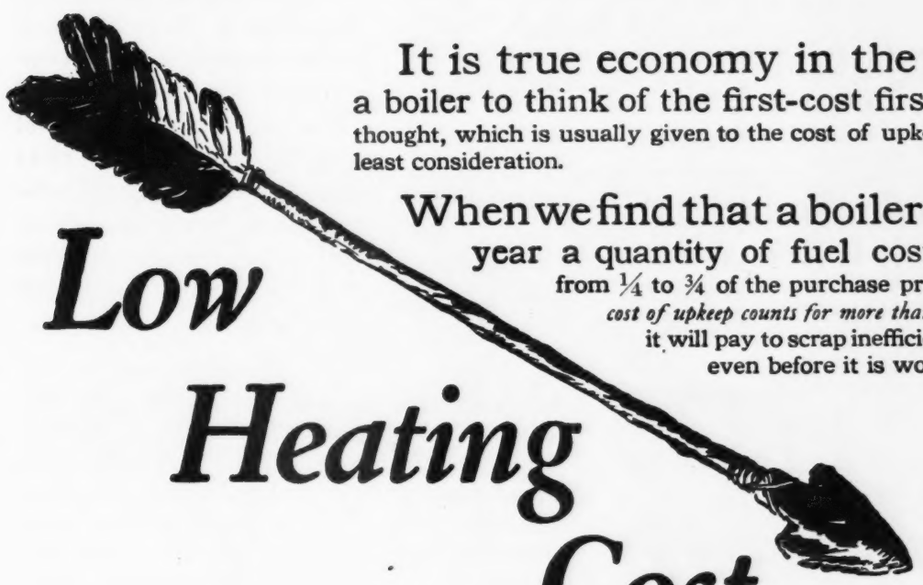
STEEL HEATING BOILERS

Factories: WAUKEGAN, ILL., BRISTOL, PA.

KEWANEE

STEEL Riveted

BOILERS



Low Heating Cost

It is true economy in the purchase of a boiler to think of the first-cost first. But the last thought, which is usually given to the cost of upkeep, must not be the least consideration.

When we find that a boiler burns every year a quantity of fuel costing anywhere from ¼ to ¾ of the purchase price, then we know the *cost of upkeep counts for more than the first cost.* Actually it will pay to scrap inefficient heating equipment even before it is worn out.

But the best time of all to scrap a cheap, uneconomical boiler is before the idea of buying it has materialized into action.

In order to figure on the least cost of heating a building, it is necessary that the first cost of the boiler be sufficient to include sound riveted construction, with the best quality of steel. And then, if the name KEWANEE is on the boiler you may be sure of all those features of design which will guarantee economy of upkeep in operation throughout the life of the building.

KEWANEE BOILER COMPANY

Kewanee, Illinois *Branches in Most Leading Cities*

STEEL HEATING BOILERS RADIATORS WATER HEATERS TANKS AND WATER HEATING GARBAGE BURNERS

VENTO

Cleveland Terminal Tower

equipped with 11,000 sq. ft. of VENTO

The Terminal Tower, Cleveland, Ohio. Architects—Graham, Anderson, Probst & White; Heating and Ventilating Contractors—A. R. Brueggeman Co.; Fan Equipment—B. F. Sturtevant. Approximately 11,000 sq. ft. VENTO installed.

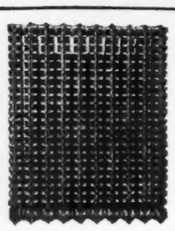
The preference for VENTO cast iron blast heaters indicated by the famous architects and engineers who planned this great project, is a reflection of the good will which VENTO heaters have won through twenty-five years of successful heating and ventilating.

Cleveland Terminal engineers recognized, of course, the familiar advantages of VENTO cored-surface design and the staggered assemblage, with the resultant high rate of heat transfer. (These features cause the most intimate contact of air with heating surfaces.)

They know also that VENTO heaters respond easily and accurately to automatic control—that they are convenient to assemble and invariably effect material saving of space—that VENTO tempering coils do not freeze up in the worst blizzards—and that thermal shock causes no fracture of metal after many years of use.

As in every instance where engineers and architects are taking alternate figures, the *net installed cost* of VENTO is demonstrated to be much less than that of other types of heaters. Obviously, therefore, there is no advantage in using other forms of heaters, since for over a quarter of a century there has never been any record of VENTO failure.

Our Engineers' Data Book and other illustrated literature on ventilation should be in the hands of Architects, Engineers and Contractors for public buildings and factories. These books are sent free on request.



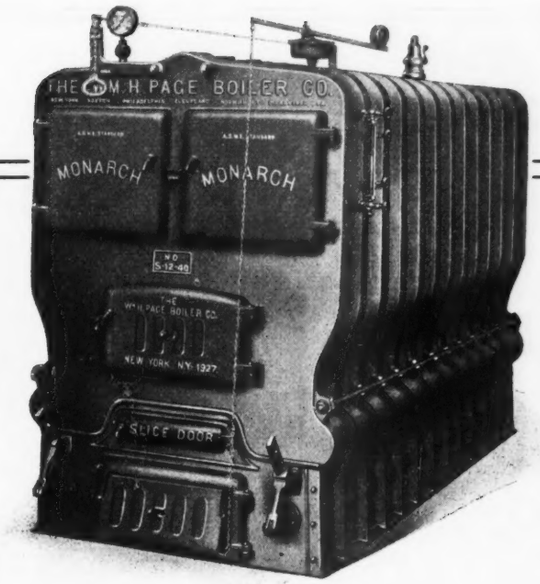
A typical stack of VENTO Cast Iron Heaters

AMERICAN RADIATOR COMPANY

VENTO DEPARTMENT: 816-820 South Michigan Ave., Chicago

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, MERCOID Controls and devices for drying, humidifying, cooling and refrigeration.

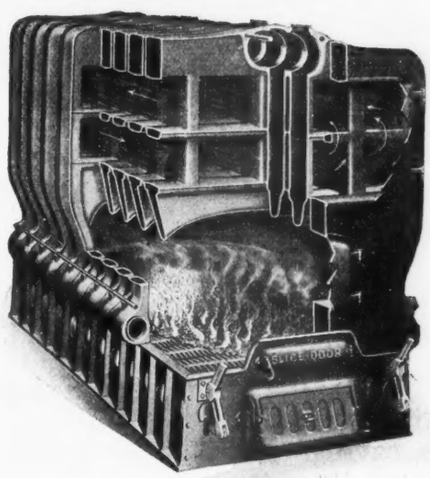
Showrooms and sales offices: New York, Boston, Providence, New Haven, Newark, Philadelphia, Baltimore, Washington, Richmond, Buffalo, Pittsburgh, Cleveland, Detroit, Cincinnati, Atlanta, Chicago, Milwaukee, Indianapolis, St. Louis, St. Paul, Minneapolis, Omaha, Kansas City, Denver, San Francisco, Los Angeles, Seattle, Toronto, London, Paris, Milan, Brussels, Berlin.



PAGE BOILERS

Meet Every Requirement

Wherever a boiler for heavy duty is required, whether for coal, gas or oil, PAGE Monarchs will do the job.



Monarch Boilers when required for use with oil-burners are largely made up into long sizes, which with the Monarch flue construction results in an exceedingly long fire travel, three times through the boiler.

PAGE Monarch Boilers are every day building a greater reputation for exceptional efficiency and economy in the oil-burner field.

The same characteristics which make for success in the burning of oil assure good results with the PAGE in burning whatever fuel is available.

THE WM. H. PAGE BOILER COMPANY

Makers of a Complete Line of Round and Square Steam and Water Boilers

200 Madison Avenue, New York

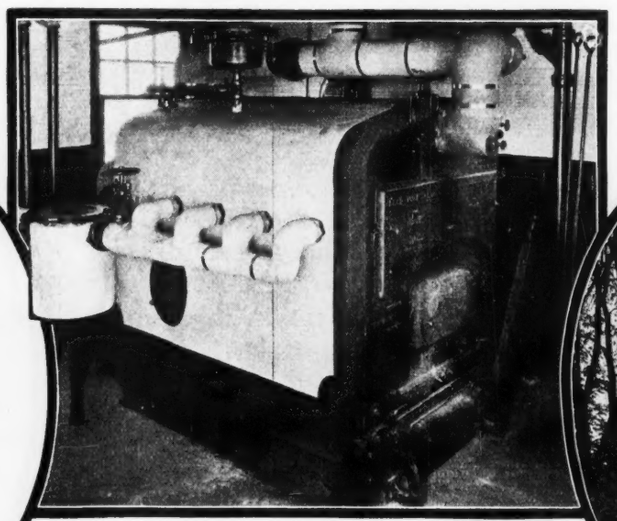
Branch Offices and Warehouses:

BOSTON, 123 Beverly St. CLEVELAND, Rose Building BROOKLYN, 98 49th Street

Factory: MEADVILLE, Pennsylvania

Just a standard specification
"HOT WATER *by* EXCELSO"

Single, Double and Triple Coil Heaters
Open view of Triple Copper Coil Excelso Heater is shown



INDIANAPOLIS, IND.
WINDERMERE APARTMENTS
Plumbing and Heating by Freyn Bros.

The whole story of Excelso desirability and economy is told in about a dozen words:

"Ample hot water supply—practically without cost—for one family or one hundred families".

Sell the water heater, saving money for more than 400,000 users; and profitable for you.

Excelso Products Corporation
DIVISION OF AMERICAN RADIATOR COMPANY
59 Clyde Ave., Buffalo, N. Y.

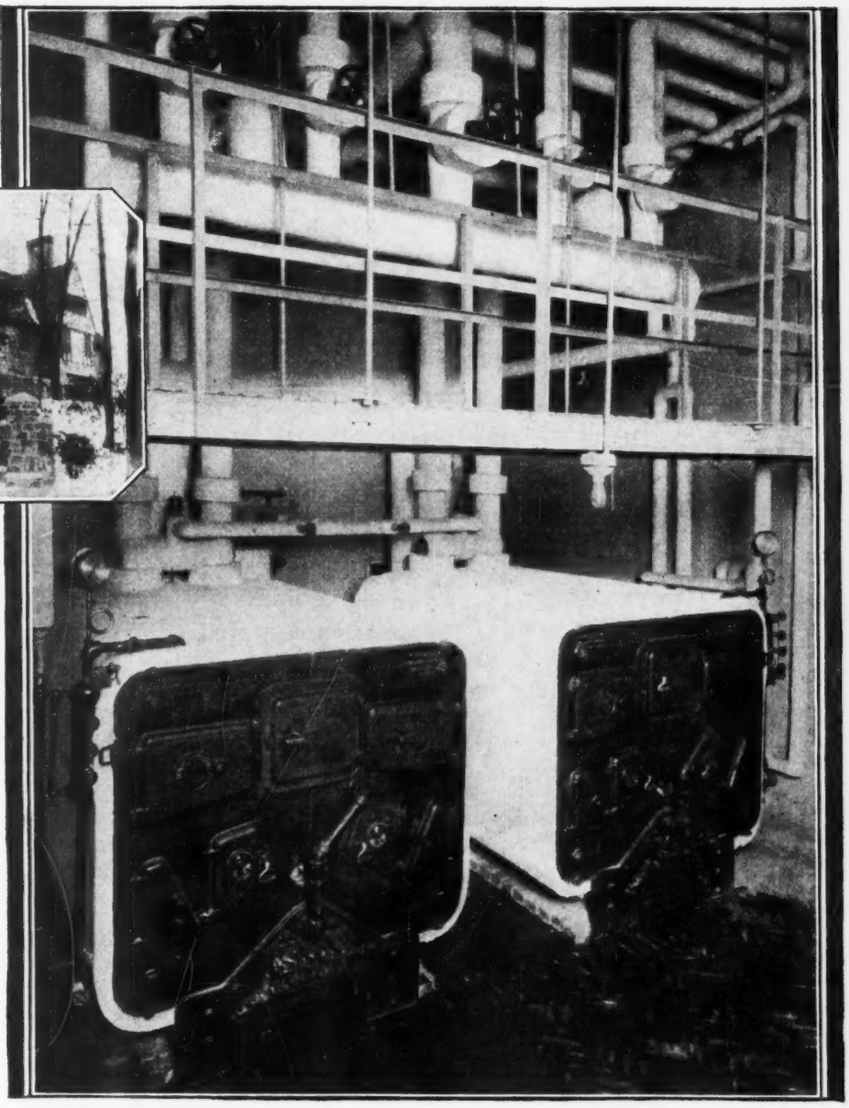
NATIONALLY DISTRIBUTED BY LEADING WHOLESALERS AND BOILER AND RADIATOR MANUFACTURERS

EXCELSO WATER HEATERS
Sold by All Plumbers and Steamfitters

Residence of
Mr. H. E. MANDEVILLE
Pleasantville, N. Y.

Architect
D. BARBER
New York City

Heating Contractor
HAUXWELL & SMITH
Port Chester, N. Y.



THESE two No. 2 Spencer Magazine Feed Heaters heat the owner's residence. In severe weather both heaters are used. In mild weather a single heater suffices. Note the neat cellar, typical of Spencer installations.

Four smaller Spencers of the single-grate type take care of servants' quarters and other buildings on the estate.

"A Size and Type for Every Heating Requirement"

Spencer
steam, vapor or hot water Heaters
burn No. 1 Buckwheat Coal

SPENCER HEATER COMPANY *General Offices:* WILLIAMSPORT, PA.

New York City Boston Philadelphia Baltimore Buffalo Rochester Hartford Albany Syracuse Scranton

Division of Lycoming Manufacturing Company

STEAM CAPACITIES: Cast Iron Sectional *from 600 feet to 3,200 feet.* Steel Tubular *from 2,000 feet to 16,000 feet*

Money Saving Reasons For The ROBRAS 20-20 The Out-Of-Way, Out-Of-Sight Radiator

These are the principal reasons (though there are many more) why you should help your customers to buy our welded brass radiators.

1. **SIZE:** Robras 20-20 radiators are 80% smaller than equal old fashioned radiators.

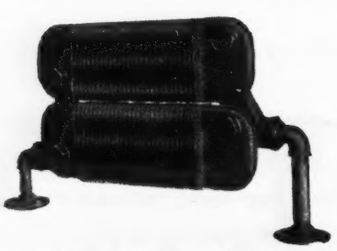
2. **SHAPE:** They can be set up in any shape you want to fit any space.
They can be single and double tiered.
They can be as many sections wide as the space permits.
An eighteen inch section has five and one-half square feet.
A seventy-two inch section has twenty-five feet.
Four sections can go in four inch furring in a space twenty inches high.

3. **WEIGHT:** Robras 20-20's are 20% the weight of old fashioned radiators.
The average weight is a pound per square foot.
Thus, in direct, indirect radiation under the floors, need no heavy expensive supports.
Then too, because of its light weight and higher heat conductivity, these brass radiators heat very much quicker than old fashioned radiators.

4. **STRENGTH:** These radiators are made of welded brass. Freezing can't harm them.

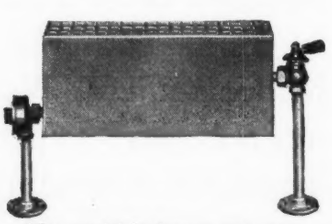
5. **UPKEEP:** Because they are brass, Robras 20-20 radiators never need to be painted.
They can't rust.

6. **YOUR PROFIT:** Not only do you get splendid discounts on these radiators, but their light weight lowers the installation cost tremendously.
Steamfitters find they can set up more than twice as many of these radiators a day as they could the old fashioned ones.



Method of tiering with special fitting.

Sections can be set up in this manner to get enormous footage.



The special bathroom unit complete with Robras section and cabinet.

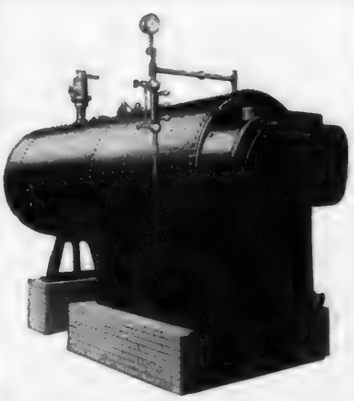
ROME BRASS RADIATOR
CORPORATION
1 East 42nd Street, New York City

TICO BOILERS

In the tallest and largest reinforced concrete building in the world

HERE is one of the latest and most prominent of the many New York buildings equipped with Tico Boilers—the Master Printers Building, 10th Ave. from 33rd to 34th Sts. Frank S. Parker was the architect and The Cascade Automatic Sprinkler Co., New York, installed the heating plant.

When you consider the fact that all the equipment going into these modern buildings was subjected to the analytical judgment of many of the countrys most foremost architects and builders, you can appreciate that Tico Boilers have more than a mere claim for boiler efficiency and boiler economy.



Titusville Iron Works Company
Titusville, Pennsylvania.

Announcing!

Shaw-Perkins
HIGH CONVECTION
Radiators

A NEW MODEL
of An ESTABLISHED PRODUCT

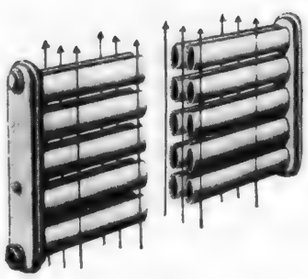
Shaw-Perkins High Convection Radiators represent an advanced design in Shaw-Perkins standard oval tube radiation, which contains original and valuable features found only in this distinctive type of heating surface.

They are low, narrow, and made in single units up to 14 feet in length; which dimensions give the radiators great adaptability. They are light in weight, heat and cool quickly, save space and are absolutely sanitary.

Being of solid one piece construction, the radiators are entirely free from mechanical joints; and are steam, water, air, gas, and oil tight. They are especially suited to installation in steam and hot water heating systems, upon walls, under windows, in recesses, upon columns or pilasters, in greenhouses, etc. Either legs or brackets can be supplied. The radiators are also particularly adapted to various drying and cooling purposes and to many industrial uses.

Get the Full Story of this Modern Radiator

SEND FOR CATALOG "H"



"HIGH CONVECTION"

The Shaw-Perkins High Convection Radiator is all prime heating surface. The ingenious arrangement of the oval tubes allows the air to pass freely over the tubes, unimpeded by fins, baffles, or top and bottom hub connections, consequently the radiator has a high heat emission by convection.

Above view illustrates the high convection feature. Arrows indicate air travel. Note the absence of any impediments to free air circulation.

Shaw-Perkins Manufacturing Company, Pittsburgh, Pa.

UNEXCELLED for Any Installation!

BENDER MEMORIAL ACADEMY

MR. JOSEPH ANDERSON, *Architect.*

E. A. STOVEKEN & BROTHER, *Contractors.*

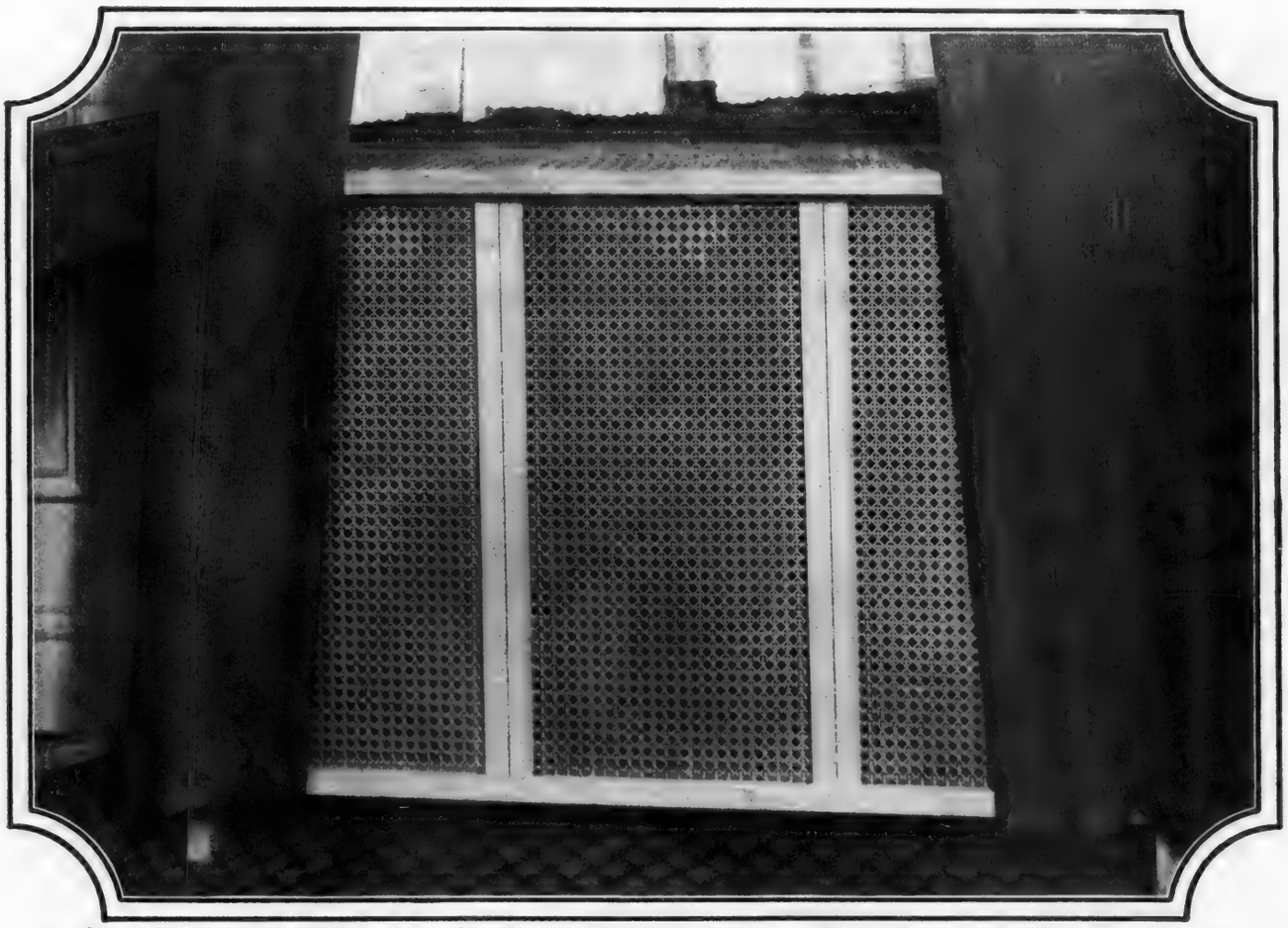
The family which gave the above beautiful Memorial was desirous of erecting a building that would be a fitting tribute to the member of their family to whom it was dedicated. They wanted the best that money could buy—a Ross steel boiler was selected to heat the building.

THE FROST MANUFACTURING COMPANY

1520 Henderson Street, GALESBURG, ILLINOIS

Eastern Distributors:
THE ROSS BOILER CO., INC., 101 Park Avenue, New York.
Branches in most leading cities.

ROSS STEEL BOILERS



Radiator Enclosure Equipped with Metalace in the Ritz Tower, New York City

EMERY ROTH, Architect TODD ROBERTSON & TODD ENGINEERING CORPORATION, Builders

Throughout this Country and Abroad Metalace is the Standard for all Forms of Radiator Enclosures and Heating Installations

Write for Illustrated Catalog with New Metalace Patterns in steel or bronze

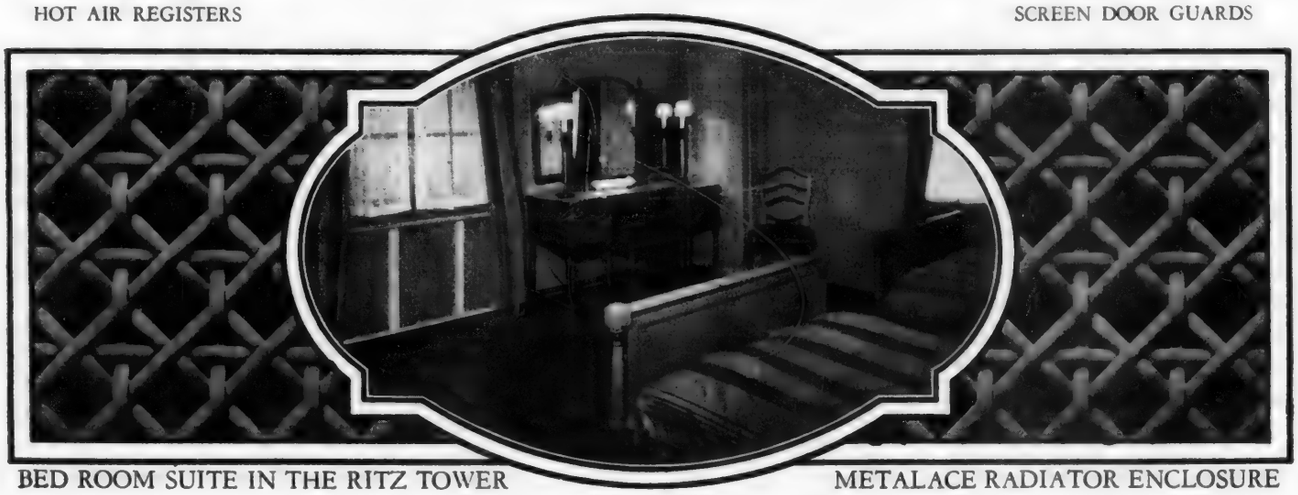
THE METALACE CORPORATION

SOUTH BOSTON, MASS.

NEW YORK OFFICE — 101 PARK AVENUE

Specify Metalace for
RADIATOR ENCLOSURES
VENTILATORS
HOT AIR REGISTERS

Specify Metalace for
INTERIOR PARTITIONS
CASHIERS' CAGES
SCREEN DOOR GUARDS

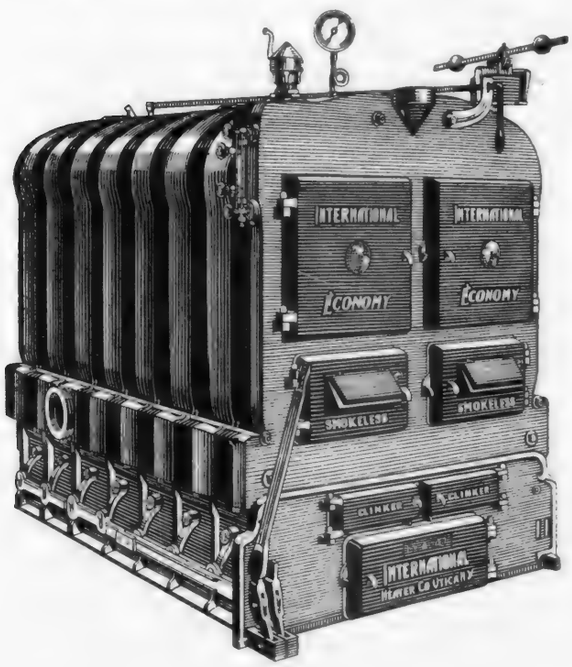


BED ROOM SUITE IN THE RITZ TOWER METALACE RADIATOR ENCLOSURE

Why Throw Away A Big Share of Your Profits?

¶ Save the cost of a pipe header by using an Economy Boiler on your next job. Clip 10% right off the estimated boiler cost and credit yourself with a bigger profit.

¶ Economy Boilers are guaranteed to deliver 98% dry steam without a header. A simple device built into the Economy separates the steam from the water so perfectly that we can guarantee less than 2% of moisture even when operating under heavy overload.



¶ The internal construction of the sections, together with a low water line, provides dry steam, perfect circulation and a steady water line.

¶ We guarantee and publish definite Radiation Loads for every size of Economy Boilers—a feature appreciated by heating contractors because it removes uncertainty and guesswork in the selection of the proper boiler for any job.

INTERNATIONAL HEATER COMPANY

UTICA, N. Y.

New York Chicago Detroit Cleveland Philadelphia Nashua, N. H.

Canadian Distributor: Heating Supplies, Ltd., 902 Home St., Winnipeg, Manitoba, Canada

A PROMINENT ENGINEER PROTECTS HIS DESIGN—

Alfred Kellogg
Consulting Engineer
Power-Heating-Lighting
89 Franklin Street, Boston, Mass

Sub: "Vinco" November 8, 1927

The Vinco Company, Inc.,
75 Vesey St.,
New York City

Dear Sirs:

1. I have been requested to express my opinion of the virtues of "Vinco" for use in the removal of sand, scale, grease, etc., from low pressure boiler installations.

2. I have for several years specified this compound for clearing new heating systems of the usual accumulation of grease and sand, and from its use have experienced the best results, so that I have no hesitancy in recommending it to the attention of others needing such compounds.

Very truly yours.

Alfred Kellogg Hmr

AK/P
c/c U.S. Radiator Co.

Alfred Kellogg

HE SPECIFIES VINCO AND MAKES SURE OF MAXIMUM HEATING SERVICE FROM THE START

VINCO CLEANSES NEW, REMODELED OR OLD HEATING SYSTEMS

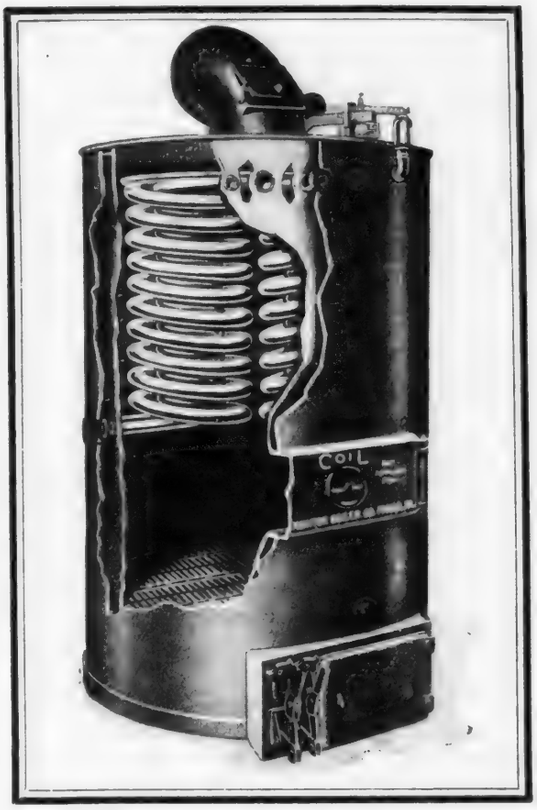
Specified by Heating Engineers and Architects
Recommended by Boiler, Radiator, Steam and Vapor Specialty Manufacturers
Stocked by Leading Jobbers

SEND FOR FULL INFORMATION

THE VINCO COMPANY, Inc.

75 Vesey Street, New York, N. Y.

OIL BURNING BOILER



COAL BURNING BOILER

COIL

STEEL HEATING BOILERS AND WATER HEATERS

FOR OIL OR COAL FUEL—

The following letter received from W. J. Hickmott, Jr., Pres. Hartford Oil Service, Inc., Hartford, Conn., is self explanatory:

"We installed one of your oil-burning boilers in our twelve-car garage. You can appreciate that with trucks going in and out of the garage continually, the temperature varies greatly. However, the boiler is so efficient that the operation of the oil burner for a very few minutes quickly raises the temperature of the garage to the desired degree."

Write for Catalog

MONITOR BOILER COMPANY
1505 Race Street, PHILADELPHIA, PA.

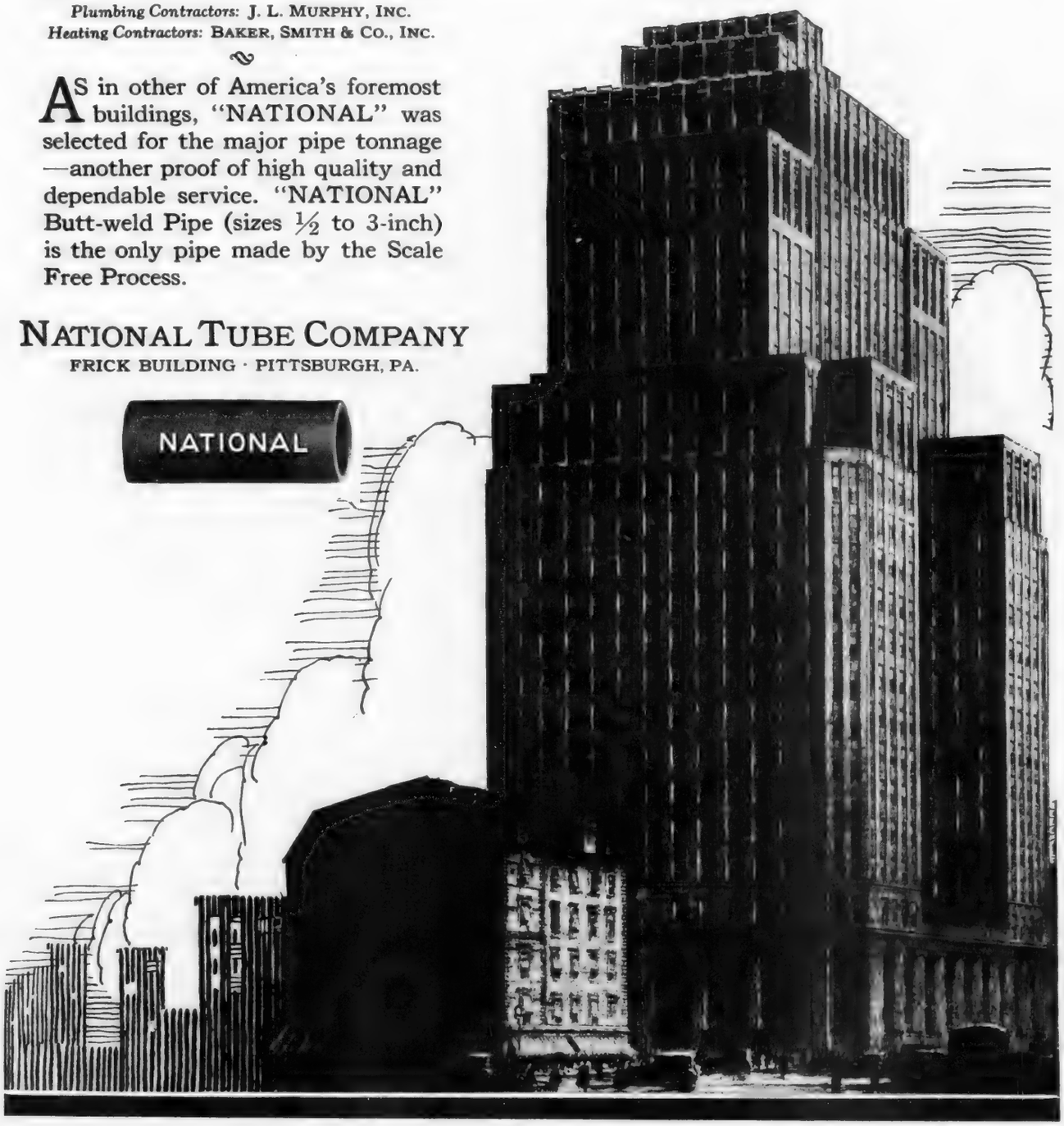
Another Monument to Industry

GENERAL MOTORS BUILDING
NEW YORK CITY

Architects: SHREVE & LAMB
Engineer: CLYDE R. PLACE
General Contractor: G. RICHARD DAVIS & COMPANY
Plumbing Contractors: J. L. MURPHY, INC.
Heating Contractors: BAKER, SMITH & CO., INC.

AS in other of America's foremost buildings, "NATIONAL" was selected for the major pipe tonnage —another proof of high quality and dependable service. "NATIONAL" Butt-weld Pipe (sizes ½ to 3-inch) is the only pipe made by the Scale Free Process.

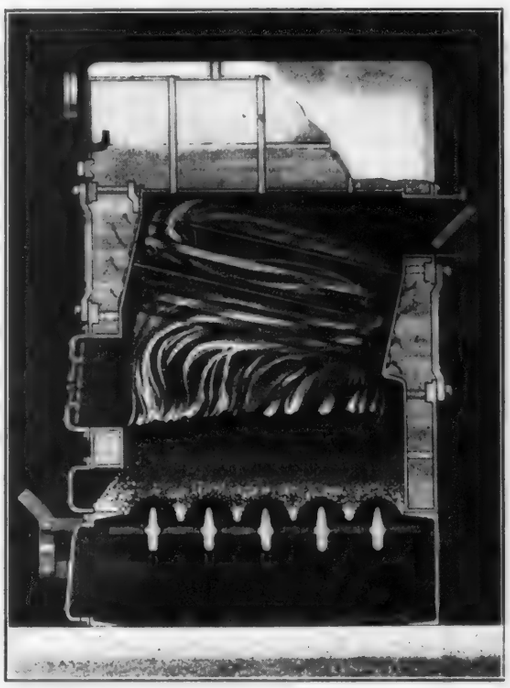
NATIONAL TUBE COMPANY
FRICK BUILDING · PITTSBURGH, PA.



The Boiler that Outlasts the Building

Because it is Built of

COPPER-BEARING STEEL and ARSENICAL COPPER TUBES



DISTINCTIVE FEATURES

Rating—rated at the NET amount of steam or hot water radiation they will supply.

Automatic Damper Control—equipped with super-sensitive damper regulators, containing a one-piece corrugated copper bellows. A manually operated damper is also provided for different weather conditions and for easy opening of draft when firing.

Grates—grate bars are semi-circular on top with teeth like a stone crusher, easily shaken, no space between them through which coal may fall.

Oil or Gas Installations—due largely to inclined Arsenical Copper Tubes and Baffle arrangement, the boiler reacts immediately when burning oil or gas.

KNOWLTON "WATERTOOB" LOW PRESSURE BOILERS are built of Copper-Bearing Steel. This feature combines the strength of steel with protection and resistance to corrosion.

WATER CIRCULATION—A number of copper tubes of small diameter placed close together gives rapid heat absorption, transmitting heat quickly and efficiently. The circulation of water is further accelerated because the copper tubes are set at an angle instead of horizontally, giving constant, rapid circulation. Baffles force the gases back and forth over the tubes, transmitting maximum heat from fuel.

Ask us about our Sales Plan

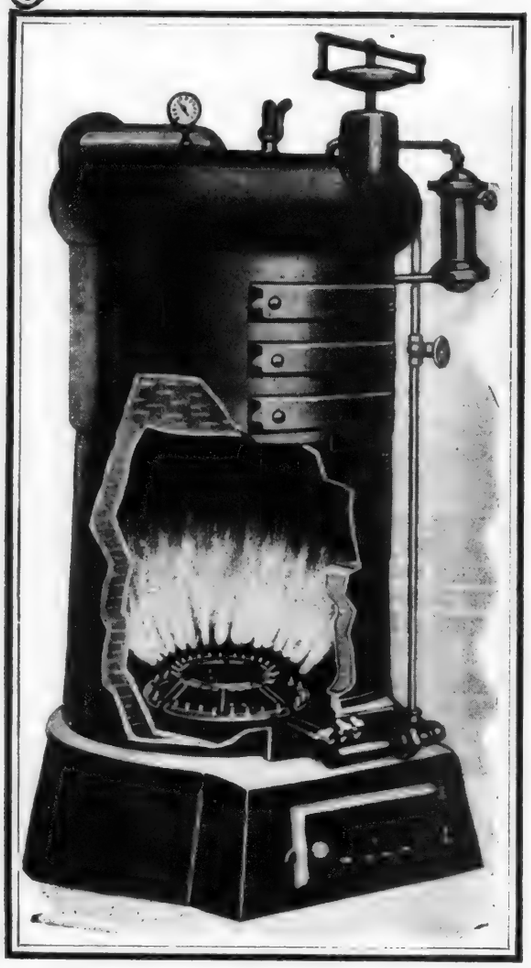
ORR & SEMBOWER, Inc., Reading, Pennsylvania

(Established Since 1885)

208 N. Clinton St., CHICAGO 50 Church St., NEW YORK

MANUFACTURERS OF KNOWLTON "WATERTOOB" STEEL BOILERS

Your stock of BARBER BURNERS *is carried at the factory*



ALL you need to do to increase your profits with BARBER Jet Gas BURNERS is to find out where they are needed, tell us the name, type and number of the heating boiler in which they are to be used and let us specify the type of burner which will give the best results.

You carry no stock—have no money tied up. *Your* BARBER BURNERS are carried by *us* at the factory.

The gas companies are pointing the way with their slogan, "You Can Do It Better With Gas." Your part is to let your trade know that they can "Do It *Still* Better With BARBER BURNERS."

Let us tell you how.

If it's done with Heat—
You Can Do It Better with GAS.

The CLEVELAND GAS BURNER & APPLIANCE CO.

Burner Specialists

3702-04 Superior Avenue, Cleveland, Ohio

ANOTHER CAPITOL STEP FORWARD

Standardized Radiator Ratings

All who are concerned with heating specification and installation will welcome this announcement as enthusiastically as they received Capitol *Guaranteed Heating*.

They know of the greater radiating surface and heating efficiency of the Capitol Radiator. They have seen its refined beauty.

Now to these superiorities has been added another great advantage—*Standardized Ratings!* Without changing Capitol Radiators one iota, the ratings have been *reduced* in the interest of standardization, offering extra value never before equalled in the heating industry.

At a single stroke the confusion and cost of refiguring radiation from varying listed ratings has been abolished.

Capitol Radiators can now be figured and installed on standard specifications, without revision.

Write for the 1928 catalog of Capitol Radiators with the new standardized ratings.

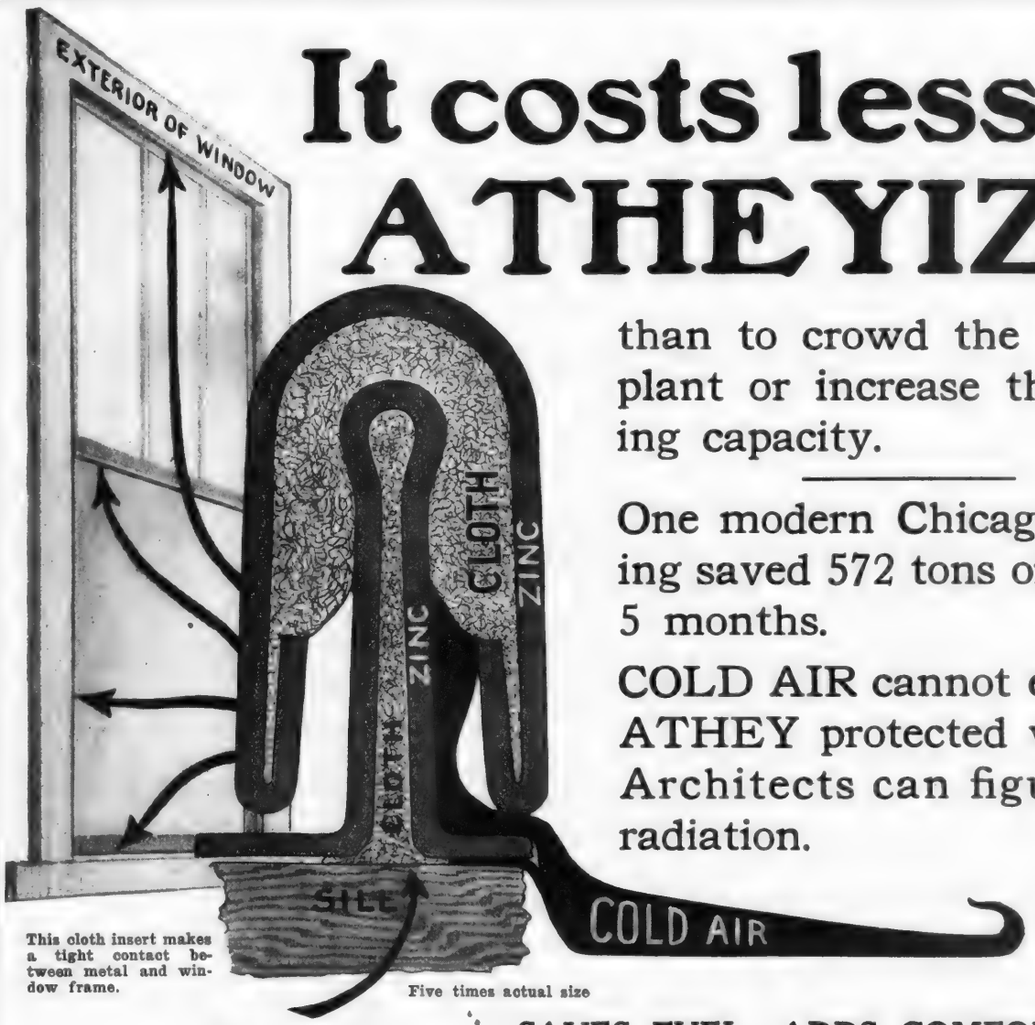
United States Radiator Corporation - Detroit, Michigan

Guaranteed Heating WITH

Capitol Boilers

AND RADIATORS

It costs less to ATHEYIZE



This cloth insert makes a tight contact between metal and window frame.

Five times actual size

than to crowd the heating plant or increase the heating capacity.

One modern Chicago building saved 572 tons of coal in 5 months.

COLD AIR cannot enter an ATHEY protected window. Architects can figure less radiation.

SAVES FUEL—ADDS COMFORT

ATHEY Cloth-to-Metal contact weatherstrips change any wood or steel window from a rattling, loose, drafty sash to one that works smoothly and quietly and is absolutely draft-proof when closed.

Why force the Heating Plant by trying to heat all outdoors when a simple ATHEY installation quickly pays for itself with the saving in fuel?

A prominent firm of New York architects made exhaustive tests of various well known mechanical devices for reducing air leakage through windows. They found that ATHEY cloth-lined metal weatherstrips were eleven times superior in reducing leakage over non-weatherstripped windows and more than four times as efficient as the best of other installations.

London Guarantee & Accident Co. Bldg., in Chicago, is one of the late prominent ATHEY - weatherstripped installations.

Send for this New Athey Book

It contains valuable information for any building owner or manager, architect or engineer desiring to save fuel, prevent drafts and increase comfort.

ATHEYIZE NOW

The difference will be noticed at once. Waste coal for two years costs more than an ATHEY installation and upkeep for 20 years.

ATHEY COMPANY

6017 West 65th Street **Chicago, Illinois**

Detroit: W. O. LeSage & Co., 410 Donovan Bldg.
Cresswell-McIntosh, Reg'd—420 Seigneurs St., Montreal, Que.

OFFICES ARE EASIER TO RENT WHEN EQUIPPED WITH ATHEY WEATHERSTRIPS OR WINDOW SHADES

Here's the U.S. Patent Office's model of Dan Stillson's wrench

From a photograph taken at the Smithsonian Institution by Underwood & Underwood.

DAN STILLSON

Steamboat mechanic in the Civil War. Master craftsman for Walworth. Inventor of the STILLSON wrench. Retired on his royalties.

Invented by Dan Stillson in the Walworth Plant and Made There EVER SINCE

DAN STILLSON was an expert mechanic in the Walworth factory when he invented the wrench that has since become the most famous and the most frequently copied tool in the world. Walworth sent him to Washington to get his original patents and bought the manufacturing rights from him.

Dan's first STILLSON is now a museum exhibit in the Smithsonian Institution, but the Walworth plant has been the birthplace of all its millions of direct descendants for 58 years.

Look for Dan Stillson's own mark —STILLSON—in a diamond on the top jaw of any wrench you buy. If Walworth made it, you'll find it. It's the mark of the genuine.

WALWORTH

STILLSON

WALWORTH COMPANY
51 East 42nd Street, New York
Distributors in Principal Cities of the World
Walworth, Limited, 10 Cathcart St., Montreal, P.Q.

It's Not the Discount But the NET that Counts

Sundstrand knows that it costs money to sell any product, and makes its margin generous and its turn-over cooperation thorough. The merchandising plan is complete, practical and workable. It insures a good NET profit and satisfied customers because of—

Product of Proven Dependability

The first Sundstrand installed seven years ago still is giving highly, satisfactory service. Every Sundstrand Oil Heat Generator is built to limits as close as a fine motor car,—within .0002 of an inch.

NO Service "Bug-a-Boo"

Average service cost per burner over a period of years has been less than five dollars a year.

Guaranteed 10 Years

Only a product of simple design, built like a fine motor car by an engineering organization of long standing and fine experience could be guaranteed for 10 years—the Sundstrand is.

Sound Institution Behind Product

The Sundstrand is backed by a Company internationally known as the manufacturers of the Sundstrand Adding Machine. Sundstrand is in the oil burner business to stay.

Sound Merchandising Plan

Prospects are "sorted." Costly door-to-door and hit-and-miss sales methods are eliminated. Sales promotion, localized newspaper campaign and intelligent man-power effort are co-ordinated into a smooth sales-getting plan.

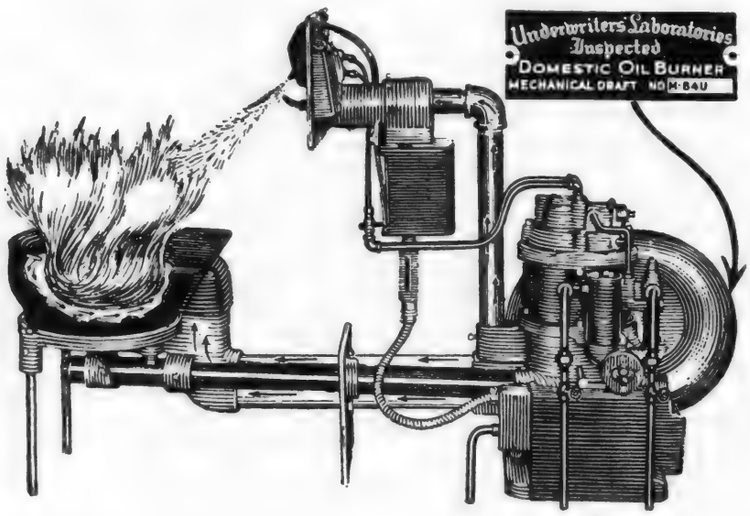
Unusual Dealer Franchise

Here's a splendid opportunity to build a sound, profitable business. The Sundstrand Franchise is different, better and more profitable to the dealer who secures it. We will furnish complete information to responsible dealers who have vision for tomorrow. Write or wire.

SUNDSTRAND ENGINEERING COMPANY

Dept. H-1, Rockford, Illinois, U. S. A.

Manufacturers of Precision Machinery Since 1905



REASONS WHY
SUNDSTRAND OWNERS BOOST

- Absolute Dependability
- Fifty Dollars Down Payment
- Full Automatic Operation
- Full Automatic Safety Control
- Constant Electric Ignition
- Quiet As a Mouse
- Adjustments for Different Grades of Oil
- Economical

GUARANTEED for 10 YEARS

Sundstrand

Constant Electric Ignition

OIL HEAT GENERATOR

GUARANTEED FOR 10 YEARS

ABC's new method of selling oil burners assures good profits

YOU can earn from $3,000 to $10,000 a year as an ABC agent.

You do not have to invest any money, burden yourself with a big contract, or even have a display room. To make a fine income all you need is ambition.

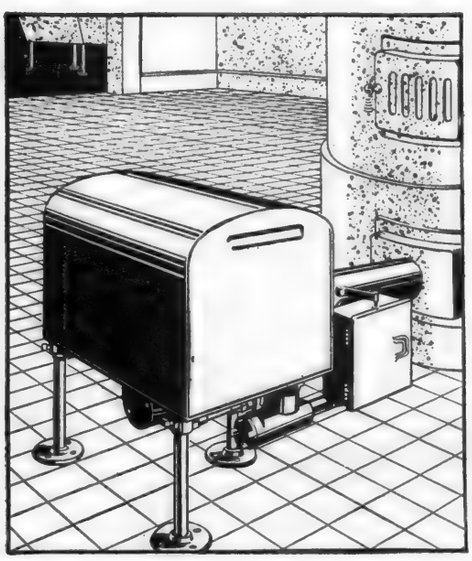
Tell us about yourself. Have you had any selling experience? What do you know about oil burners? How long have you lived in your city? Your letter will be considered confidential.

AUTOMATIC BURNER CORPORATION
312 North May Street
Chicago

THE Burner WITH A Brain

THE new control system on the Nu-Way furnishes ignition each time the burner begins operation. If electric power is shut off, for a minute or for a day, the ignition will be ready when the current is re-established. This control always functions. Never out of order. A miraculous automatic device that works for you twenty-four hours a day. Nu-Way is made in six sizes—a burner for every heating purpose—for domestic hot water—for homes of every size—for hotels, apartments or office buildings. Each Nu-Way burns the cheapest grades of oil.

Listed as Standard by Underwriters' Laboratories



MEMBER OIL HEATING INSTITUTE OIL HEAT AS DEPENDABLE AS SUNSHINE

Write for catalog, prices and terms

NU-WAY

An Automatic OIL BURNER

Manufactured and sold by

THE NU-WAY CORPORATION

ROCK ISLAND, ILLINOIS

The HIGH-GRADE (Low-grade-Oil) BURNER— HARDINGE

Paradoxical? No. Read on.

The Hardinge Burner burns the lower grades of oil—even crank case drainings—with amazing efficiency. *It is the highest-grade burner of low-grade or high-grade oils!*

It is generally admitted that the idea of burning "cheap oil" has a startling appeal to all home owners. All dealers are recognizing what this means to Hardinge franchise holders. For, remember, when it is said that *the Hardinge burns any oil that flows,* this means more than just BURNS—it means that Hardinge burns low-grade oil SATISFACTORILY to *Dealer* and *Owner.* THE HARDINGE SELF-CLEANING FEED VALVE AND PATENTED AIR RING FREE DEALERS FROM SPENDING PROFITS ON SERVICE CALLS.

Herein are net profits for dealers, and efficiency and economy for owners—Hardinge *really burns* low grades of oil, which contain more heat units than high grades and yet cost maybe 25% less, so that Hardinge owners enjoy possibly a 30% economy on fuel—*and Hardinge burners are doing this in thousands of cases with practically no service calls being necessary.* Right there—PRACTICALLY NO SERVICE CALLS—is where your NET profits are.

It took genius to design and make a burner that efficiently burns low-grade and high-grade oils, but it doesn't take a genius to *realize what this is meaning to Hardinge dealers* in SALES as the knowledge that *Hardinge burns cheap oils without trouble* gains momentum in the public mind. Where DEMAND, QUICK SALES, FEW SERVICE CALLS are, net profits are obvious.

The precision-built Hardinge is really a precision machine. The Hardinge is the burner referred to in those magazine articles which state: "There is *one* burner on the market which is so perfected that it works with *watch-like precision.*" THAT'S HARDINGE PERFORMANCE—with low-grade or high-grade oils. Think it over.

If you are a substantial dealer, we shall be glad to discuss the Hardinge Franchise with you. Write or call.

HARDINGE BROTHERS, Inc.

Manufacturers of Precision-Built Machines for 37 Years

Factory and General Offices:
4149 Ravenswood Avenue, Chicago

Factory Branches:

Chicago
Michigan Ave. at Ohio St.

Boston
839 Beacon Street

you can safely have confidence in

HARDINGE FUEL OIL HEAT

Webster Ignition will Reduce Service calls

The Webster Ignition Transformer combines in one efficient unit all the desirable features that insure dependable ignition and freedom from troublesome service problems...Its uniformly successful operation is causing additional oil burner manufacturers to adopt it as standard equipment...Far-sighted dealers will do well to insist that this Transformer be used on the oil burners they sell... It will reduce service calls to a minimum.

WEBSTER ELECTRIC CO., *Racine, Wis., U. S. A.*

"Specialists in Oil Burner Ignition"

The Webster Ignition Transformer can be furnished with either single or double high tension terminals, 110 or 220 volts, 60 cycle, 110 or 220 volts, 25 cycle.

Webster Ignition Transformer

You CAN *make money* *on* OIL BURNER Installations

MERCOID Controls Actually Eliminate Costly Servicing

No. 612 MERCOID Combination Low Water Cut-Out and Pressure Control. Wide Adjustability—Close Control.

No. 848—Model A-1—for pressure control on steam. Dotted line indicates No. 848—Model G bulb for hot water.

No. 845 MERCOID Thermostat for room temperature control.

Model C MERCOID Vapor Control—especially designed for vapor and low pressure, where very close control is required.

MEMBERS of the heating industry all over the country are saving service costs on their oil burner installations through the employment of MERCOID controls. The simplicity of MERCOID Controls is your protection. One of the biggest factors in the elimination of servicing with MERCOID is the fact that all MERCOID Controls carry the full line current—either 110 or 220 volts—D. C. or A. C.—any cycle. Every manufacturer and dealer knows how very important this is—especially with the boiler control which should be able to stop the burner without the complication of relays or transformers.

SEND TODAY! for illustrated literature on MERCOID Controls for oil burners. Use the Coupon

AMERICAN RADIATOR COMPANY

ACCESSORIES DIVISION

816-820 South Michigan Avenue Chicago, Illinois

American Radiator Co.
Chicago, Ill.

Send me free illustrated literature on MERCOID Controls for Oil Burners.

Name.....

Street.....

City.....“H”

Insulated and Uninsulated Buildings
—figuring heating requirements

Do you take insulation into consideration when you are figuring the heating requirements in new buildings? The use of proper insulation makes possible considerable savings in radiation and heating equipment. This is especially true in schools, apartments, industrial buildings, etc., wherever there is a large roof area.

Insulite structural insulation has been accepted by engineers and architects for more than sixteen years. For roof insulation it is made in two thicknesses, one-half and one inch. It is light and easy to handle—but at the same time has a strength of its own which eliminates waste through breakage. It is not harmed by moisture or exposure to the weather.

The engineering staff of the Insulite Company has prepared a file of interesting and helpful data and insulation charts, which are certain to be of real help to you in figuring heating requirements. They will be glad to send you a copy if you use the coupon shown below.

Insulite Products

ROOF INSULATION
SHEATHING
WALL BOARD
PLASTER BASE

The material in all Insulite Products is the same — it is wood fiber, fabricated into broad rigid sheets, and having a high insulating efficiency.

Insulite

The Insulite Co.
Minneapolis, Minn.

If you desire a copy of this bulletin just put your name on the coupon below. No obligation to you.

THE INSULITE CO.,
Minneapolis, Minn.

Please send me your file of insulation data.

Name .....

Address .....

City..... State.....

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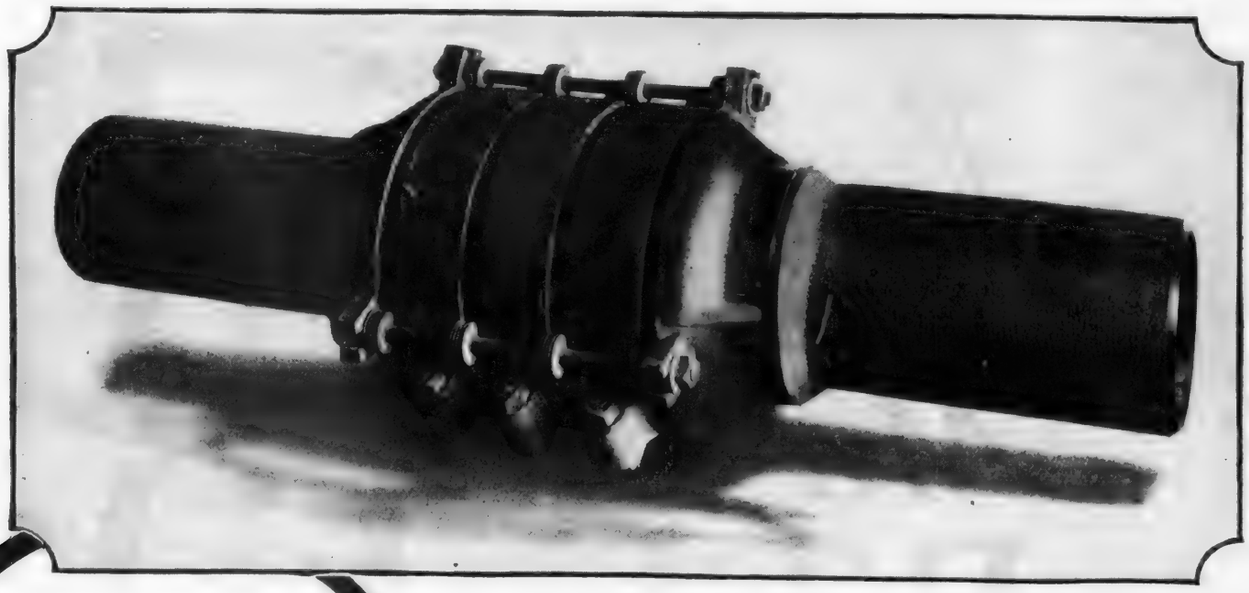
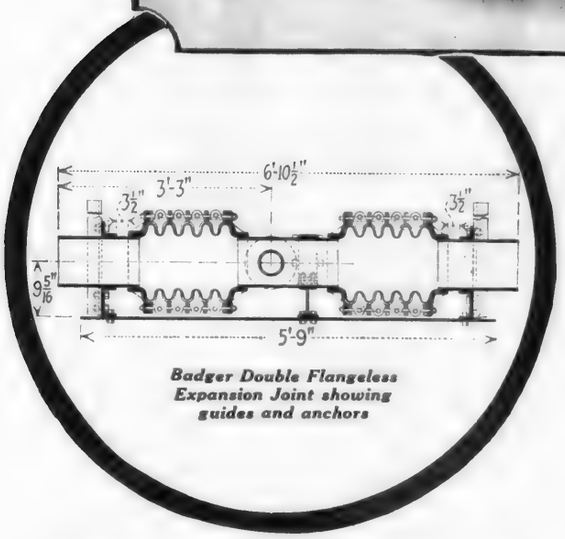




Badger Double Flangeless Expansion Joint showing guides and anchors

Minimize underground piping maintenance—

BADGER Self-Equalizing Expansion Joints with either wrought iron or steel open pipe ends, chamfered for welding into the pipe line—will freely take up the expansion and contraction in both underground and overhead pipe lines. They are packless, and cannot leak.

Because the stresses are uniformly distributed over all the corrugations of the one-piece copper expansion member by the machined equalizing rings, the wear is negligible. Years of continuous hard service are assured without maintenance expense.

Badger Self-Equalizing Expansion Joints are furnished in either flange or welding types, either single or double. Standard pipe anchors and guides can be furnished. The double joints are furnished in complete units mounted on structural steel base with anchorage and guides bolted in place.

Write us for new Bulletin.

Badger Engineering Service

Badger engineers are designers, manufacturers and installation experts for the following and kindred power plant products:

PIPE BENDS
CHEMICAL APPARATUS
COPPER AND SHEET METAL WORK

E. B. BADGER & SONS CO.

75 Pitts St., BOSTON, MASS.

New York: 271 Madison Ave. **Tulsa, Okla.: Mid-Continent Bldg.** **Toledo: Ohio Bldg.**

Representatives in all principal cities

BADGER EXPANSION JOINTS

ESTABLISHED 1841 · WEATHER VANE ON FANEUIL HALL · E.B. BADGER & SONS COMPANY · TRADE MARK

Introducing Mr. B.T.U.

Gentlemen:

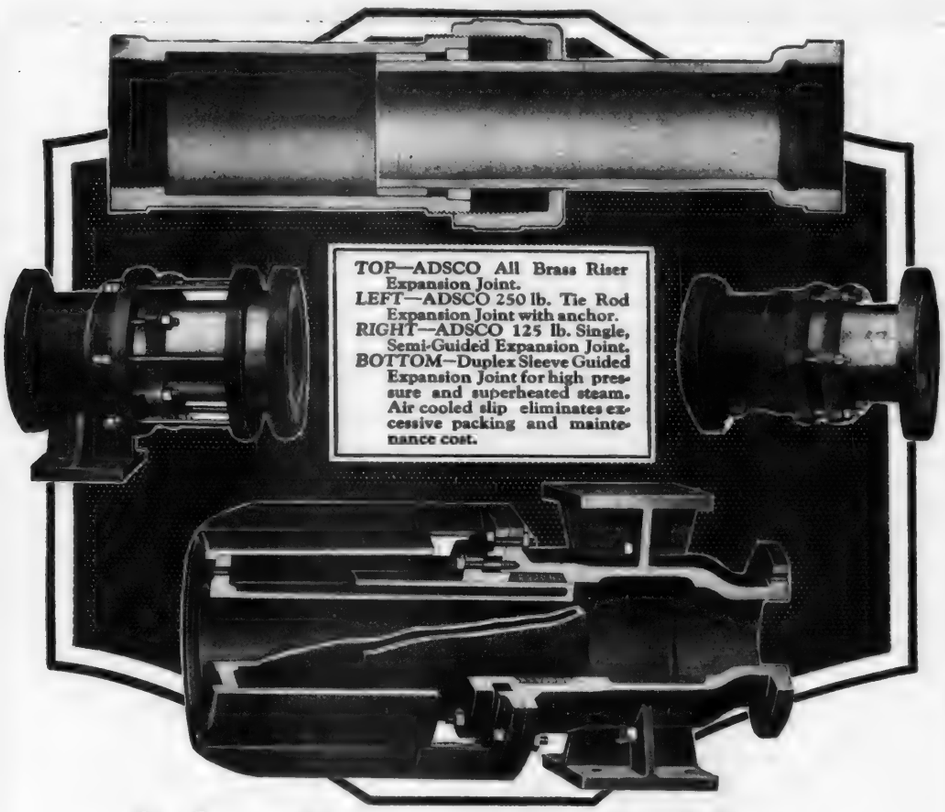
Meet Mr. B. T. U., Grand Ruler of the Realm of Heat—the Power that runs your plant.

Mr. B. T. U. is recommending BANROC PRODUCTS because his subjects do more work when protected by BANROC INSULATION.

Mr. B. T. U. has written a booklet, "BETTER INVESTMENTS," that will interest you from an insulation standpoint. Send for a copy NOW.

BANNER ROCK PRODUCTS COMPANY
ALEXANDRIA, INDIANA

ORIGINATORS OF ROCK WOOL PRODUCTS



TOP—ADSCO All Brass Riser Expansion Joint.
LEFT—ADSCO 250 lb. Tie Rod Expansion Joint with anchor.
RIGHT—ADSCO 125 lb. Single, Semi-Guided Expansion Joint.
BOTTOM—Duplex Sleeve Guided Expansion Joint for high pressure and superheated steam. Air cooled slip eliminates excessive packing and maintenance cost.

Solve Expansion Problems

ELIMINATE expansion troubles from pipe lines with ADSCO Expansion Joints.

Built for low pressure, high pressure and superheat service—for lines conveying steam, water, oil, air, gases and liquids. Users frequently report from 10 to 20 years of continuous service without leaking or repacking.

Performance plus convenience of installation are the reasons for the increasing use of ADSCO Expansion Joints in power plants and piping work.

A scientifically proportioned stuffing box combined with correct design for anchorage and provision for careful guiding of slip is the reason why every ADSCO Expansion Joint renders long, uninterrupted service without leaking or repacking.

FREE! Valuable Reference Book

"The Blue Book on Expansion." Contains condensed tables of expansion in pipe lines and complete dimensions. Will save you much time in the selection of the correct type of expansion device for any service requirement.

AMERICAN DISTRICT STEAM COMPANY
GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N.Y.

Offices and Agents in Principal Cities

ADSCO
EXPANSION DEVICES

A few of the many other ADSCO Expansion Joints

ADSCO Expansion Variator will outlast the line itself and render uninterrupted service. Packingless design. For pressure ranges up to 125 lbs.

ADSCO 250 lb. Double Externally Guided Expansion Joint with anchor and service. Allows for expansion on either side of its service connection or anchor point.

ADSCO 250 lb. Single Externally Guided Expansion Joint. With anchor, no service.

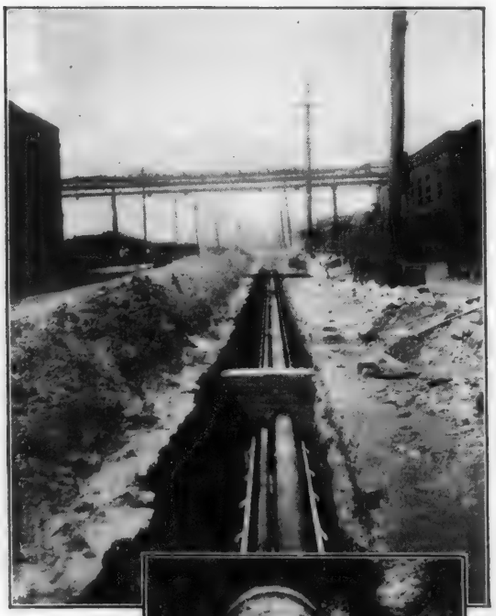
ADSCO Standard Iron Body Single Expansion Joint. Its low cost makes it an economical expansion joint to use for either hot water or steam heating work.

CONSULT OUR ENGINEERS' SERVICE DEPARTMENT

WHENEVER you have a problem pertaining to the distribution of steam from a central source, whether underground, overhead or a combination of the two, bring it to ADSCO.

Through our Engineers' Service Department we offer you the benefit of our 50 years' experience in solving problems of steam distribution, ranging from the centralized heating of a few buildings to district heating operations, embracing large downtown business areas.

SPECIALISTS IN STEAM DISTRIBUTION FOR OVER 50 YEARS



This installation of Ric-wiL Conduit with Dry-paC insulation at Bayway, N. J., was interrupted for two weeks at the point shown in the lower picture and the open end of the conduit, filled with Dry-paC, subject to flooding for two weeks. No moisture penetrated the line beyond the first section of Ric-wiL, a remarkable demonstration of the waterproof qualities of Ric-wiL and Dry-paC. Geo. Bail, Union City, N. J., Architect; The Raisler Heating Co., New York, Heating Contractors.

Ric-wiL's 7 POINT EFFICIENCY

1—Safe, immediate drainage, lower in cost than round drain.

2—Conduit with Loc-liP Side Joints, sealing and locking split sides together, water-tight, easily inspected.

3—Quickly installed pipe supports, external, strong.

4—Four types of insulation, including Dry-paC, to meet all conditions.

5—Cast Iron Ric-wiL for extra heavy duty.

6—Compact, interlocking, fully engineered throughout.

7—Such economy of labor, trenching and extra materials that Ric-wiL often costs less than ordinary field-built conduits.

Now Underground Conduit Insulation that Defies Water

THE Loc-liP Side Joint made Ric-wiL Conduit water-tight; outside moisture cannot enter, as many miles now installed and in service have proved. Now Dry-paC insulation guarantees inside dryness. Moisture from pipe leaks cannot spread through the conduit or wet the insulation; flooding from manholes is impossible. A specification for Ric-wiL with Dry-paC is assurance of unusually high efficiency that stays dry and profitable. Write for a test sample of Dry-paC and complete information about Ric-wiL.

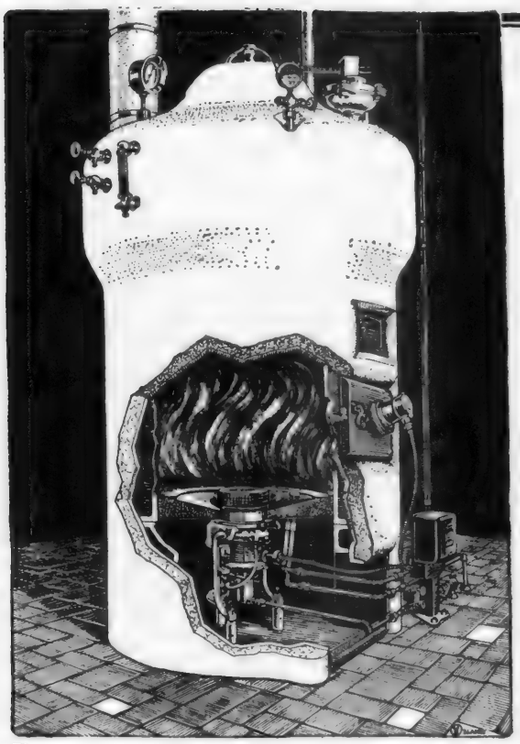
THE RIC-WIL COMPANY

Originators of Waterproof Conduit Filler

1567 Union Trust Bldg. Cleveland, Ohio

RIC WIL

UNDERGROUND CONDUIT



A Proved, Profitable, Product

THAT sells on performance; stays sold and is profitable to sell. TORIDHEET has proved itself to be a very attractive proposition to dealers seeking to build up a permanent business—and one paying good returns. Manufactured by an old-line, financially strong concern that has specialized in precision machine work over many years, TORIDHEET is both built right and backed right. Sales resistance is greatly eliminated when the prospect knows that there is no danger of his burner becoming an orphan, and when simplicity of design and good workmanship are evident to all.

TORIDHEET does its work well on a minimum of service calls. Dealer's profit is not eaten up by this item. TORIDHEET is easily and quickly installed.

And TORIDHEET sells at a low price.

If you are thinking of establishing yourself in this coming business and wish to assure profit and permanency, do not overlook the TORIDHEET. Get in touch with us and learn the details of our dealer proposition and let us satisfy you that no better or more saleable oil burner is built than the TORIDHEET.

CLEVELAND STEEL PRODUCTS CORPORATION
Madison at West 74th Street .. .. Cleveland, Ohio

$385.00

Complete with operating and safety controls. Installation costs vary with capacity of tankage desired. LISTED AS STANDARD BY THE BOARD OF UNDERWRITERS.

Noiseless—*as a cat's tread.*
Enjoyable—*as your radio.*
Super-safe—*under all conditions.*
Economical—*to install and operate.*
Low in Price—*high in quality.*

TORIDHEET
OIL BURNER
FOR BETTER HOME HEATING

A
big
business,
like a pyra-
mid, must rest
on a solid founda-
tion. That foundation
is the confidence it in-
spires. ¶ Heat Transfer
Products, Inc., is an engi-
neering and manufacturing com-
pany composed of men, each of
whom has won his spurs in the field
in which he works. Many of them already
have won your confidence by serving you
well during their former connections. ¶ Hand-
picked from the vineyard of experience, these men
—whether they design or deliver, produce or sell—
are now banded together for the purpose of continuing
their efforts with renewed vigor. ¶ Backed by the largest
organization producing heat transfer equipment, they bring
to you the results of thirty-three years of manufacturing ex-
perience. And their sole aim is to serve you better than ever
before, if that is possible, and to continue to merit and hold your

CONFIDENCE

Engineering data and estimates will be gladly furnished on equipment for the following applications:

Power Plants	Gas Plants	Refrigeration
Oil Refining	Air Conditioning	Textile Mills
Chemical Plants	Heating and Ventilating	Laundries, etc.

Send for information on the type of apparatus in which you are interested.

HEAT TRANSFER PRODUCTS, Inc.
A Division of the
STATEN ISLAND SHIPBUILDING CO.
90 West Street, New York

Efficient

Boiler efficiency may be measured by

(1) The ratio of output to rating.
(2) Fuel consumption to output.
(3) Labor expended to output.
(4) Maintenance cost to output.
(5) Quick steaming qualities.

In each of these, separately and collectively, the Stanwood Boiler stands supreme in its field.

It is conservatively rated.

It conserves fuel by extracting every possible heat unit.

It is easily fired.

Cleaning and overhauling are reduced to a negligible degree.

A full head of steam is quickly obtainable without undue strain. The Stanwood takes care of a liberal percentage of overload.

For Coal, Oil or Gas. 29 to 250 H.P. (3,500 to 31,000 sq. ft. steam radiation). Built for working pressures of 15, 100, 125, and 150 lbs. or higher if desired.

Rapid Circulation

A result of excellent design, the rapid circulation of the Stanwood prevents accumulation of scale and sediment, absorbs a maximum of heat from combustion and flue surfaces and results in low stack temperature.

Down Draft

Pre-heated, full oxygenated air perfects combustion on the upper grate. Combustion is completed on the lower grate. Fine ash, few clinkers, completely consumed fuel is the result in the ash pit.

Construction Advantages

In the Stanwood there are no crown sheets, no stay bolts, no fire-exposed circumferential seams and no mudlegs to collect heat absorbing sediment. A minimum of brickwork obviates air leaks and radiation losses; the low water level permits installation with minimum excavation.

Stanwood Smokeless Boilers

All Steel Riveted Construction

Write Dept. D-18 for our latest catalog

The
STANWOOD
CORPORATION

Manufacturers of Smokeless Boilers, Horizontal Return Tubular Boilers, Stacks, Breechings, Tanks, and Feed Water Heaters.

Established 1891

CINCINNATI
OHIO

Announcing Centrifugal Vacuum Pump Merger

EFFECTIVE JANUARY 1, 1928, the business formerly known as the Young Pump Company becomes an integral part of the C. A. Dunham Company, and the Young Centrifugal Vacuum Pump is henceforth a consolidated unit with the Dunham Vacuum Pump, the latter being a laboratory development of many years' effort.

The Dunham Vacuum Pump (exhibited at the recent Power Show in New York), under which name the combined unit will be known, contains the principle and general form of the Young Pump together with all its many advantages well known to users. Added to this, from the Dunham Research, is the large displacement capacity, a marked increase in water capacity and the ability to draw an unusually high vacuum simultaneously with the discharge to the boiler, in keeping with the needs of improved heating practice.

Nineteen Hundred and Twenty-eight marks the twenty-fifth anniversary of the C. A. Dunham Company. At one end of this quarter century span will be found the invention which revolutionized heating in 1903—the Dunham Thermostatic Radiator Trap. At the other end, the equally revolutionary Dunham Differential Vacuum Heating System which, through the use of Sub-Atmospheric Steam, solves the Nation's problem of Overheating.

THE manufacturing plant at Michigan City, Indiana, where Dunham Pumps are now made, will be greatly increased in capacity during 1928. This will give the Dunham Company three large and thoroughly modern plants, one in Marshalltown, Iowa, one in Michigan City, Indiana, and one in Toronto, Canada.

Through these changes, and by reason of this important consolidation, it now becomes possible to still further extend the scope of service rendered to the Nation's heating, by that most remarkable achievement of the decade — means for successfully circulating steam at sub-atmospheric temperatures and at widely varying pressures.

We feel that this, our twenty-fifth anniversary year, will mark the beginning of even a greater period of fulfillment than has the quarter century now brought to a close, and to this end we pledge all the efforts and resources of a well trained organization whose lives and interests are a part of this enterprise.

The DUNHAM Difr-enshal-Vacm Heating System
A FIXED DIFFERENTIAL IN PRESSURE — A VARIABLE DEGREE OF VACUUM

U. S. Patent No. 1644114. Additional patents in the United States, Canada, and Foreign Countries now pending.

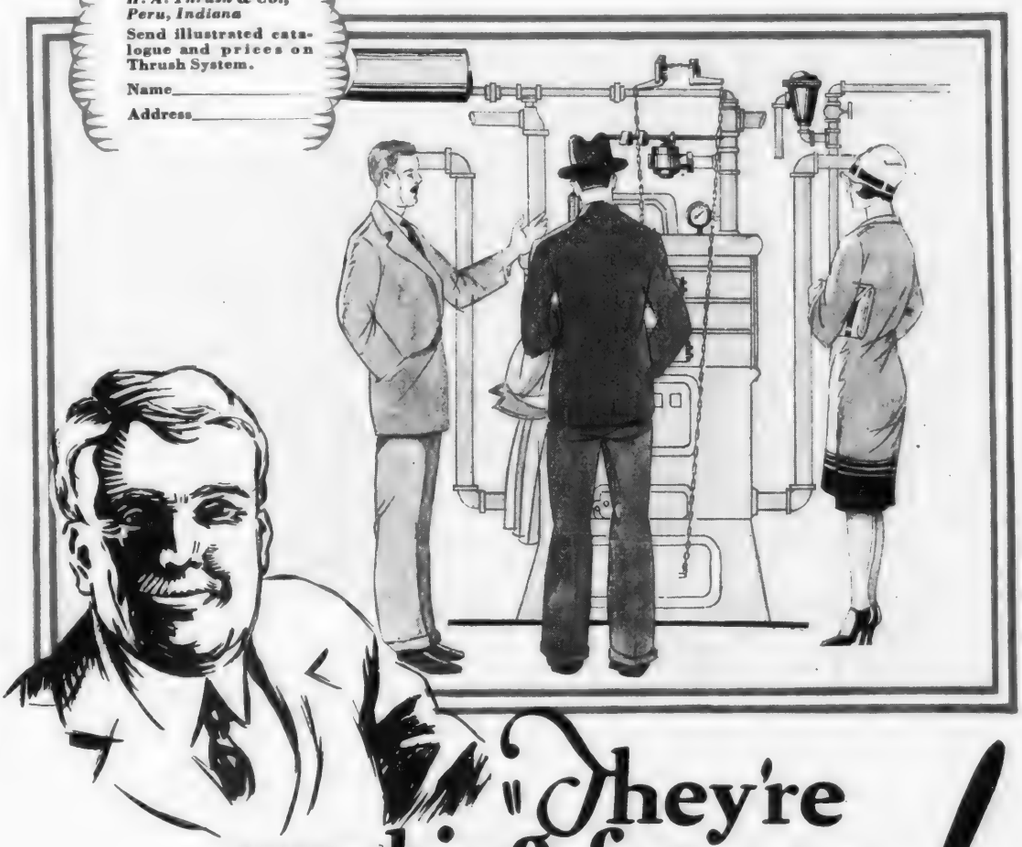
C. A. DUNHAM CO.

Dunham Building, 450 E. Ohio St.

CHICAGO

Over seventy branch and local sales offices in the United States, Canada and the United Kingdom bring Dunham Heating Service as close to you as your telephone. Consult your telephone directory for the address of our office in your city. An engineer will counsel with you on any project.

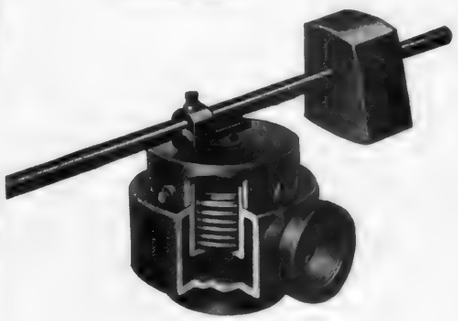
MAIL NOW
H. A. Thrush & Co., Peru, Indiana
Send illustrated catalogue and prices on Thrush System.
Name_____
Address_____



"They're working for me telling their friends about Thrush System"

Safe!

Your reputation is safe when you have installed Thrush Equipment on your customer's heating plant. It is dependable.



THERE'S a lot of solid satisfaction in knowing that you have given your customer the best—a Hot Water Heating Plant, Thrush Equipped. And it's good business too! When a satisfied customer thinks enough of his heating plant to take his guests to the basement to tell them about it, he's going to give you a real boost and your business is going to grow. Thrush Equipment makes the job so much more efficient and satisfying that your customers will do that very thing. Specify Hot Water Heat, Thrush Equipped, on every job.

H. A. THRUSH & CO.
Peru, Indiana

THRUSH SYSTEM
OF HOT WATER HEATING

A Bigger and Better Organization

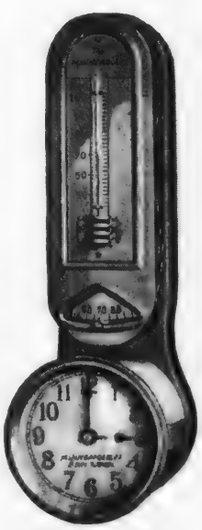
— *proving its advantages to heating men!*

The merger of the two leaders in automatic heat control was a big step forward in this important branch of the heating industry. This fact becomes more and more evident as the new organization takes hold of the old problems with redoubled energy and enthusiasm.

A single purpose — united resources — two remarkable records of engineering achievement now consolidated into one — these powerful advantages are beginning to tell in every phase of the business.

This means that automatic control will continue to demand an ever greater share of your attention as one of the indispensable factors in modern heating.

Honeywell Model R



Minneapolis Model 77

MINNEAPOLIS
REGULATOR COMPANY
HONEYWELL

Executive Offices: Minneapolis *Factories:* Minneapolis and Wabash, Ind.

"... *faster! faster!*" cried the Queen. And they went so fast that they seemed to skim through the air . . . Alice looked round her in great surprise! "Why, I do believe we've been under this tree the whole time! Everything's just as it was!" . . . "Of course it is," said the Queen, "you see it takes all the running you can do, to keep in the same place."

[*Alice in Wonderland "Through the Looking Glass"*]

". . . faster, faster!" . . . Every hotel was up-to-date—once. To keep it up-to-date means eternal vigilance—constant attention to details. Leave it alone and it goes backward . . . Faster, faster—read in the column at the right how a great Minneapolis hotel saved money and made money by a small investment in modernizing the heating system.

- since 1888

Webster Systems of Steam Heating

Visit Booths 41 - 42 CHICAGO POWER SHOW

Warren Webster & Company, Camden, New Jersey
Pioneers of the Vacuum System of Steam Heating
52 Branch Offices — *In Canada, Darling Bros., Ltd., Montreal*

More than 46,000 installations in America's finer buildings

WHEN the Leamington Hotel (Minneapolis) was built, more than fifteen years ago, its heating system was considered to represent the best practice at that time.

But standards of heating efficiency have advanced materially since 1910 . . . and the alert management of a prominent apartment hotel, serving both permanent and transient guests, must be on the watch for new developments which make for the greater comfort of guests.

In 1921, it was decided to modernize the system through the use of Webster Sylphon Attachments which were installed that year on practically all radiators. The result of this modernization was a net annual saving of $534.94—*a return of 17 per cent on the investment!*

A temperature of from 70°-75° is easily maintained in every room . . . in addition, improved economy . . . heating service contributes to the greater comfort of their guests.

Your heating system of 15-20 years ago may have been the "last word" when installed. Has age overtaken it? If so, an astonishingly small investment will transform it into a modern Webster System of Steam Heating. Send in the coupon for a preliminary survey.

Fill in and mail to Warren Webster & Co., Camden, N. J.

Name of Plant or Bldg. .....

Location .....

Area and Volume Heated .....

Type of Heating System .....

☐ Gravity Steam ☐ Hot Water
☐ Open Return Line ☐ Vacuum
☐ One or Two Pipe ☐ Warm Air

Pressure Carried .....

Name of System (If any) .....

How many Boilers .....

Size .....

Vacuum Pumps ☐ Electric..... ☐ Steam.....

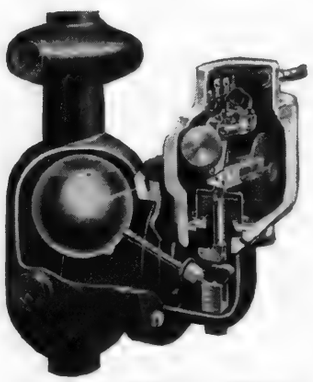
Troubles now experienced (State in margin)

CON-TAC-TOR

Announces the addition to their line of the electric controls formerly manufactured by

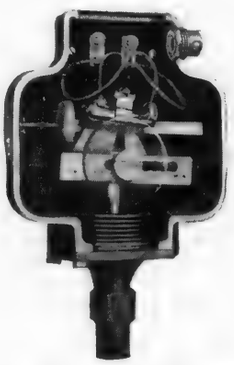
McDONNELL and MILLER

consisting of



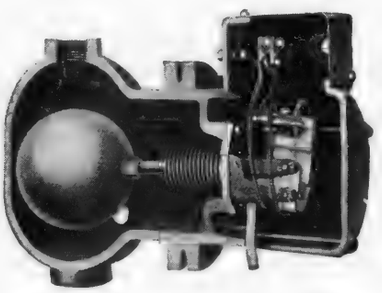
NO. 131 DUPLEX SWITCH

The No. 131 Duplex Switch —a combination low water cut off and pressure control. Easily installed in gauge column tappings. Pressure range 9 oz. to 10 lbs. with adjustable differential.



NO. 132 VAPOR SWITCH

The No. 132 Vapor Switch—for pressure regulation on Mouat, Broomell, Veco and other vapor systems. Furnished either high or low voltage. Range from 3 oz. to 9 oz. with adjustable differential.



NO. 133 LOW WATER CUT OFF

The No. 133 Low Water Cut Off. An inexpensive protection for non-recycling and industrial type burners. Manual or automatic reset. Two types for 25 lbs. to 100 lbs. maximum pressure.

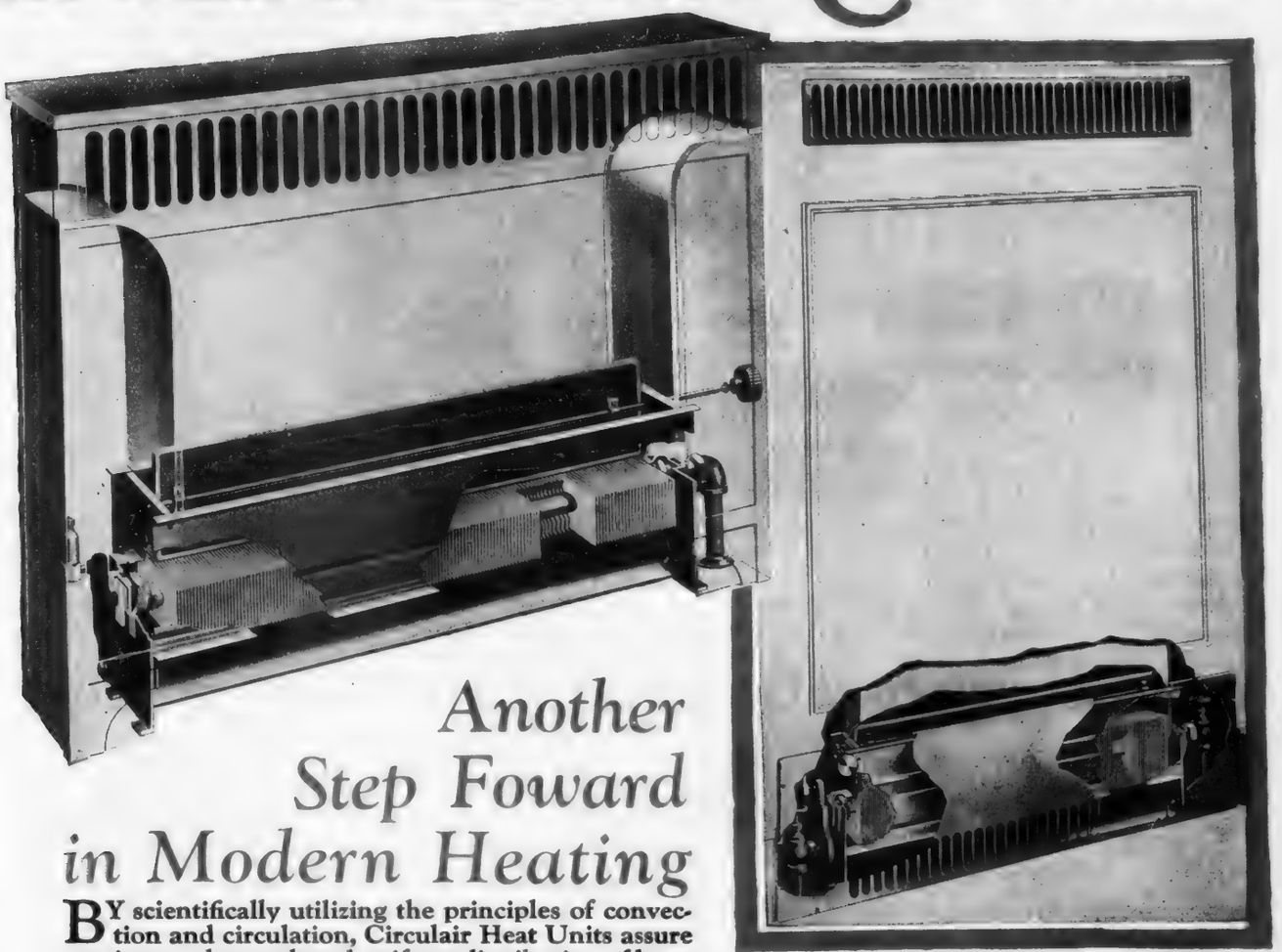
Write for Literature

ABSOLUTE CON-TAC-TOR CORPORATION

Automatic Electric Controls

ELKHART, INDIANA

In Wall *or* Cabinet—Circulair



Another Step Foward in Modern Heating

BY scientifically utilizing the principles of convection and circulation, Circulair Heat Units assure maximum, thorough and uniform distribution of heat. Unusually compact, they may be readily concealed in the ordinary wall or housed in attractive cabinets.

Note These Six Distinct Advantages

[1] *Oval Copper Tube*—straight, seamless and free from recesses—insures even distribution of heat over entire plate areas and permits free circulation of air.

[2] *Removable Panel* permits immediate access to heater and piping.

[3] *Cold-Air Deflector* increases over-all efficiency seven per cent.

[4] *Self-Contained Unit* (consisting of heater, deflector and damper), mounted in heavy casing, prevents damage in handling and simplifies installation.

[5] *Air-Tight Damper* on heater itself prevents leakage, cutting off heat entirely when closed.

[6] *Air-Valve Return Casting*—of heavy cast bronze—allows use of siphon air valve with its consequent fuel economy and trouble-free operation.

DESIGNED and developed by Willis H. Carrier, dean of scientific air conditioning, Circulair Heat Units completely fill the requirements of modern building arrangements and make possible new standards of comfort, convenience, economy and beauty.

Illustration, top left, shows Circulair in cabinet form, making this distinctly new method of heating available to owners of existing buildings. Cabinet may be connected to present piping.

Illustration, top right, shows Circulair installed between studs of an ordinary wall.

Complete data and catalog fully describing revolutionary improvements to be found in Circulair Heat Units mailed on request. CIRCULAIR HEAT, Incorporated, 218 Central Ave., Louisville, Ky.

Circulair HEAT

Use This

CIRCULAIR HEAT, Incorporated, 218 Central Avenue, Louisville, Ky.

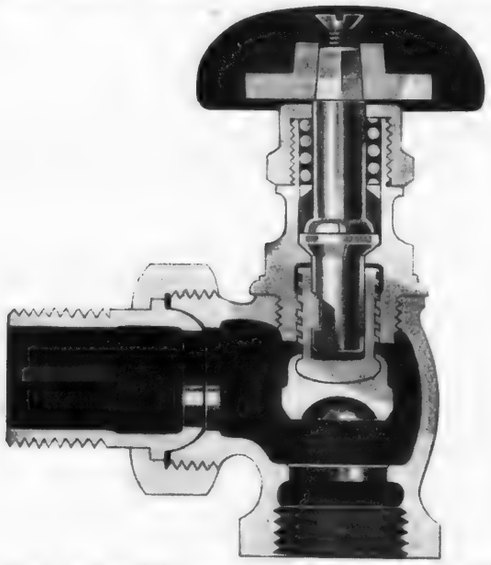
Send, without obligating me, catalog and complete data on Circulair Heat Units.

Name .....

Address .....

City ..... State .....

Marsh Re-enforced Packless Water Radiator Valves



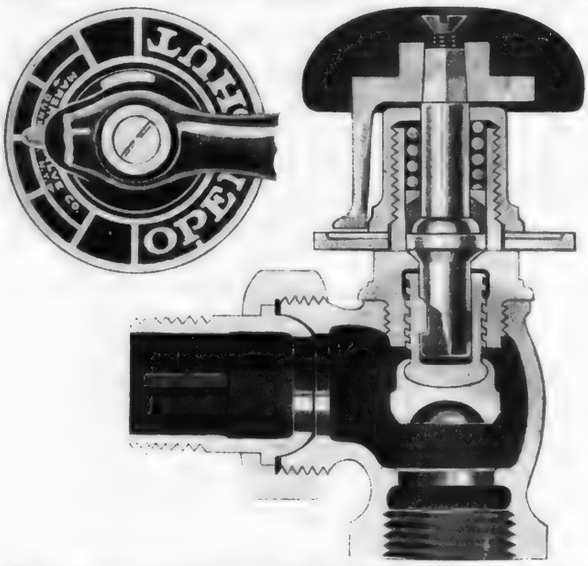
Oval Wheel
or
Lock Shield

Fig. 137

These valves are quick opening, full pipe capacity, and are GUARANTEED NOT TO STICK AT ANY TIME, OR LEAK AT ANY PRESSURE that a cast iron boiler and radiation will stand.

We believe they are the only Packless valves which will hold high pressure forced circulation and also protect against taking in of air around stem in a sealed system, *two very necessary requirements* for satisfactory service and cost no more than the cheap competition valves. Get our prices.

Marsh Re-enforced Graduated Water Radiator Valves



Oval Wheel,
Lever Handle
or
Lock Shield

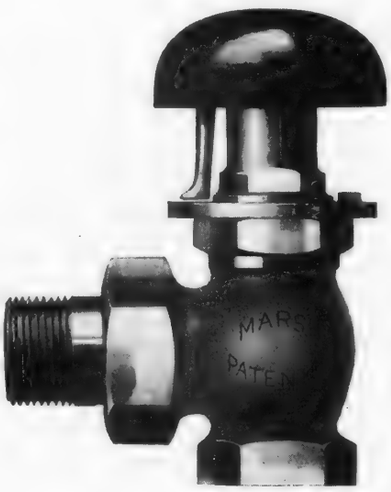


Fig. 139

With these GRADUATED Valves we regulate water heat temperature THROUGH VALVE, the same as for a vapor or vacuum steam system through a Modulating Valve. These are not only of material value for residence service, but we have thousands in use for high pressure service in schools, hospitals and public buildings.

These valves cost but little more than our regular water valves and much less than steam modulated valves.

MARSH VALVE COMPANY

DUNKIRK **NEW YORK**

Exclusive Sale Distributors

Edward T. Hetherington
1718 Sansom St., Philadelphia

Appleton & Liptrott, Inc.
1480 Broadway, New York

John W. Mabbs,
431 So. Dearborn St., Chicago, Ill.

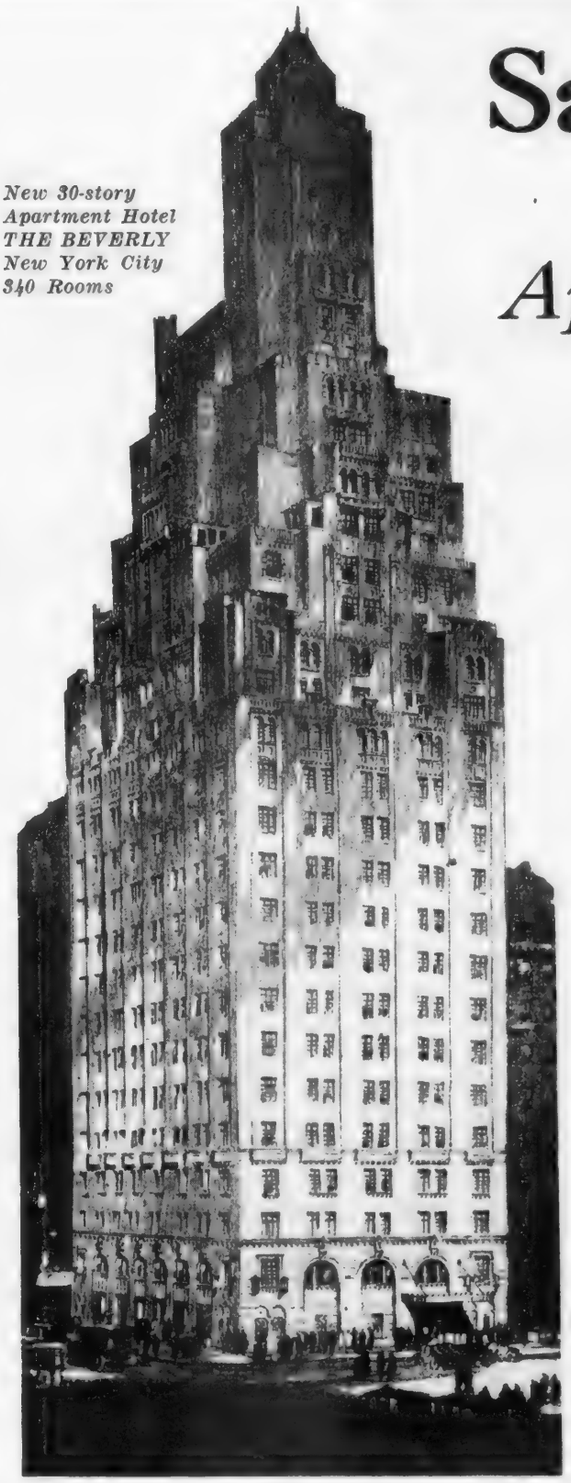
United States Radiator Corp'n
General Offices: Detroit. Mich.

Jas. P. Marsh & Company
118 So. Clinton St., Chicago. Ill.

All territory east of west lines of Michigan and Ohio and north of Virginia, except New York and Philadelphia.

All territory south of Ohio River and west of Michigan and Ohio, except Cook County, "Chicago, Illinois."

Taylor-Forbes Company, Guelph, Ont., Canadian Agents



New 30-story Apartment Hotel THE BEVERLY New York City 340 Rooms

Satisfaction in Modern *Apartment Hotel* Heating

WHEN a heating system was selected for the new 30-story, 340-room apartment hotel, "The Beverly", at 50th Street and Lexington Avenue, New York City, a BARNES & JONES SYSTEM was specified, because it is quiet, clean, economical, quick to respond when heat is wanted and as quickly and easily shut off or modulated when less heat is required.

Apartment house tenants are difficult to satisfy, for the degree of heat desired is apt to vary with each tenant. The flexibility of the BARNES & JONES SYSTEM, therefore, makes it ideal for apartment buildings. It is noiseless—no pounding radiator pipes disturb tenants—and radiators heat up or cool off at a finger touch on the modulator!

THE BARNES & JONES SYSTEM is giving satisfaction in some of the largest and finest of modern apartment buildings in Boston, New York and other large cities—as unfailing and efficient on the 30th floor as on the first.

The owner and builder of "The Beverly" is the Lexington-Concord Corporation (Moses Ginsberg, president) 247 Park Ave., N. Y. C. The architect was Emery Roth; Sylvan Bien, associate, 1440 Broadway; and the heating contractor, the George E. Gibson Co.

Barnes & Jones

QUALITY HEATING SYSTEMS

128 Brookside Ave., Jamaica Plain, Boston

126 East 44th St. New York City

Under Each Unit Heater—an Armstrong Trap

THE little fellow underneath this unit heater is a No. 30 Armstrong Trap, particularly suited for draining individual heater units. It drains the condensate regardless of the temperature and keeps the heater at its highest efficiency.

The inverted submerged bucket principle (a patented exclusive Armstrong feature) is responsible for its extreme simplicity, positive action, small size and large capacity. The Armstrong Trap removes all air with the condensate, and it can't clog, for the sediment, scale and oil go out with the discharge. The valve is either wide open or closed and no wire drawing can result. Wear resisting heat treated chrome steel valves insure continued trouble-free operation. Armstrong Traps are noted for their steam economy and low maintenance. They are moderately priced.

No. 30 Armstrong Trap, ideal for draining individual heater units.

1 It positively will not air-bind —removes air from the system.

2 The valves won't score—they're heat treated chrome steel.

3 It can't clog—all sediment and scum go out with the discharge.

4 A small trap with a large capacity. Less heat loss through radiation. No steam waste.

5 Because of the small size, it is easy to install—no foundations or supports are necessary—requires only simple connections—and makes a neat looking job.

The standard Armstrong Trap for all general draining purposes. It has a larger capacity than the No. 30.

ARMSTRONG MACHINE WORKS

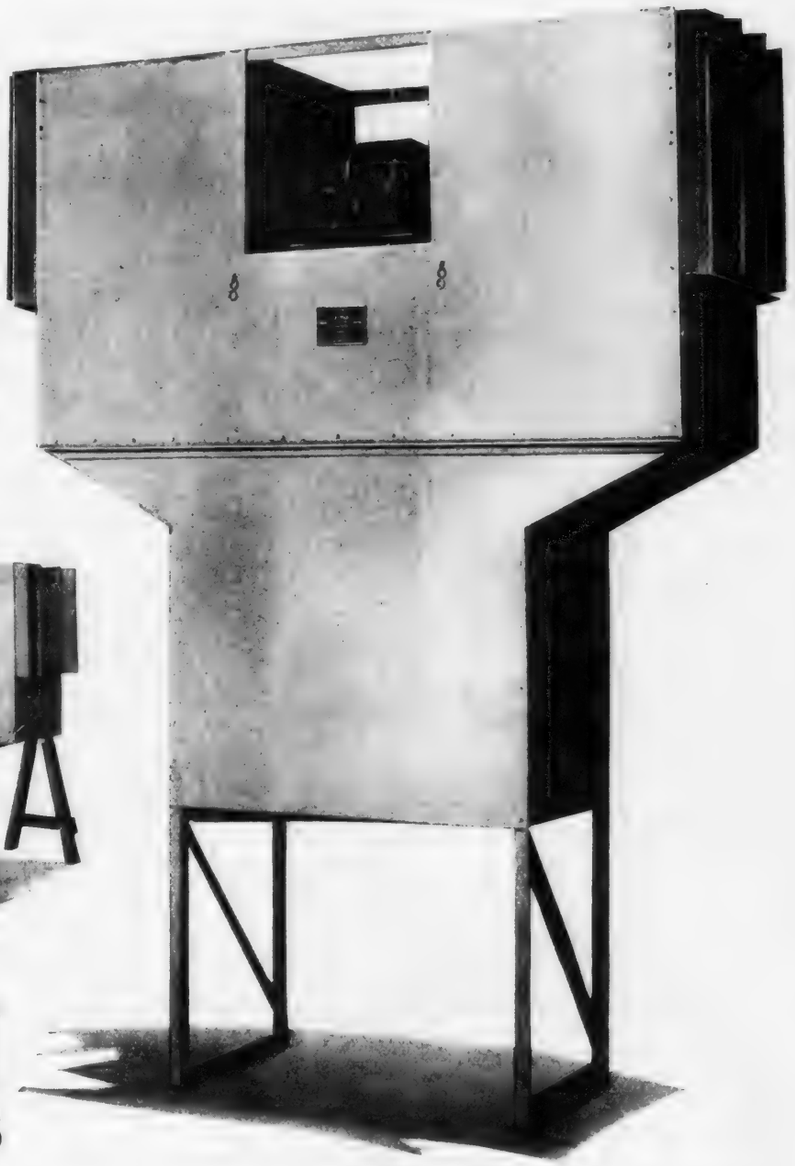
346 Maple Street, Three Rivers, Michigan

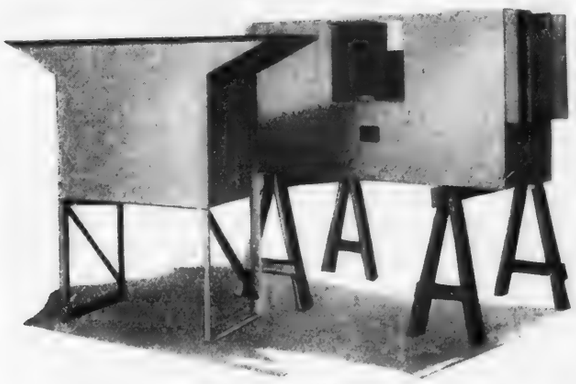
District Representatives in 36 Cities

ARMSTRONG "INVERTED BUCKET" STEAM TRAP

H&V 1—Gray

NOW Shipped Completely Assembled





TWINFAN
UNIT HEATERS

TWINFAN Unit Heaters are now shipped assembled in just two units. All that is necessary for installation is to place one unit on top of the other and bolt together. Steam connections have been greatly simplified. There is only one steam supply and only one return connection required, except in the large Heaters Nos. 77 and 102, which require two connections.

A more detailed story of the improvements and refinements made in this new TWINFAN Heater is found in our Bulletins Nos. 201 and 202, which we will be pleased to send on request.

At right is shown a Twinfan Unit Heater suspended from a brick wall. It rests on an angle and the top corners are supported by strap hangers. All supports are bolted to the unit and attached to the wall by lag screws.

DWYER EQUIPMENT CO.
4534 W. NORTH AVE. CHICAGO, ILL.

HEAT WITH WINFAN UNIT HEATERS

1475 *Trane Bellows Packless Valves*

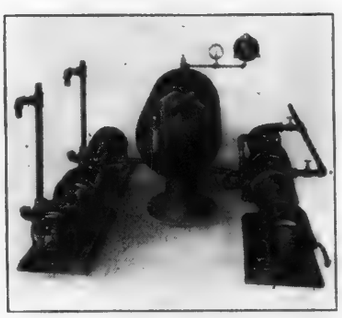
1495 *Trane Bellows Radiator Traps, also* 21 *Trane Drip Traps*

100% Trane Equipped

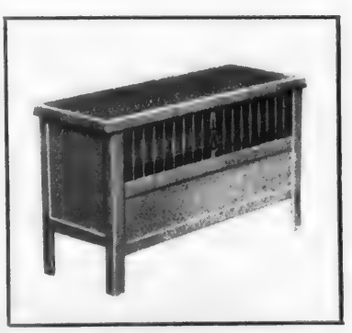
—the world's largest cooperative apartment building

THE large installation of Trane products in the Touraine, one of the outstanding structures on Chicago's famous Lake Shore Drive, typifies the confidence of heating men in Trane equipment.

This job is notable from every standpoint—because of its size, the high character of the project, and the fact that it is 100% Trane. Let us explain why so many heating engineers and contractors standardize on Trane. Write for catalogs and bulletins. The Trane Co. (Est. 1885), 206 Cameron Ave., La Crosse, Wis.



Trane Four-motor Vacuum Pump



970 *Trane Heat Cabinets*

HEAT CABINETS **TRANE** CONCEALED HEATERS

··· PUMPS AND HEATING SPECIALTIES ···

A little thing on your radiators

but a Big thing in fuel saving

The "Warco" No. 2 Vacuum Valve

This new "Warco" No. 2 Vacuum Valve, installed on every radiator, will actually revolutionize any one-pipe steam heating plant.

It not only expels air from a radiator, but *keeps it out*. The vacuum that results means greater heat with *less fuel* at any time, and, when the fire is checked, it means *lasting* heat, because the steam is not driven from the radiator by inrushing air.

Furthermore, the liberal "Warco" discounts mean real profit for you, every time you insure to a customer this uniform, botherless, *controllable* steam heat. It is *permanent* profit, too, because—like all of the Seven Improved "Warco" Valves—this dependable, fool-proof "Warco" No. 2 is guaranteed, when properly installed and operated, to give five full years of satisfactory service.

Order now through your preferred Wholesaler and write us direct for interesting folder, "Make Your Steam Installations Do Better Work"

W. A. RUSSELL & COMPANY, Grand Central Terminal Bldg. New York City

Chicago Boston Pittsburgh Los Angeles

Established 1890

"Warco"

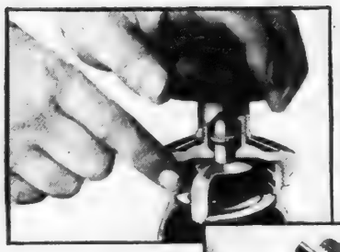
TRADE MARK REGISTERED

Automatic Air & Vacuum

Valves

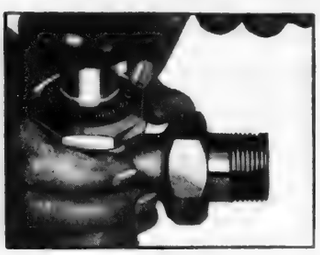
"Warco" No. 3V and "Warco" No. 6

When "Warco" No. 2 is installed on the radiators, "Warco" No. 3V, a ¼" Bottom - Outlet Vacuum Valve, should be used on small mains, coils or risers. On larger installations, "Warco" No. 6, a Quick - Vent Vacuum Valve, should be used, because of its exclusive adjustable feature to EQUALIZE THE MAINS.

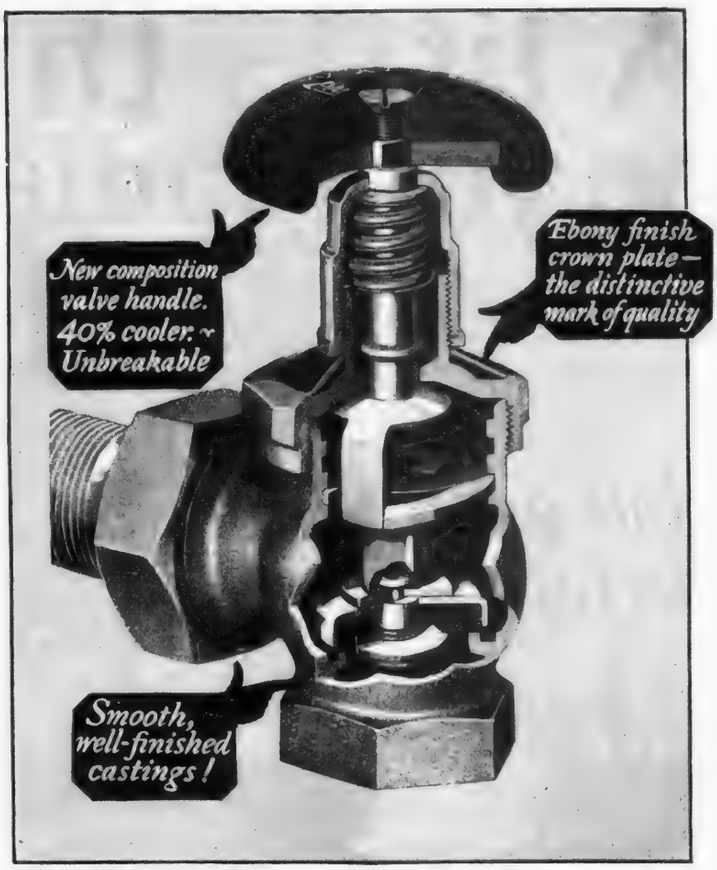


The power which opens or closes the valve in one turn is applied through a spiral disc and is carried to two points on the outer rim, instead of working on the center of the disc.

This illustration shows why the ARCO Packless Valve never needs repacking. It is always kept tight by the pressure of the compression spring which forces the moulded ring down into leak-proof position.



The distinctive mark of ARCO Packless is the ebony black crown plate. The plate may carry the name of the contractor etched in relief on the smooth black surface when specially ordered.


New composition valve handle. 40% cooler. Unbreakable
Ebony finish crown plate—the distinctive mark of quality
Smooth, well-finished castings!

This will help you sell
ARCO Packless Valves *for every job*

Use the illustration on this page to assist you in convincing your prospective customer of the advantages of No. 988 ARCO Packless Valve. You know that a modern radiator valve should have four fundamental characteristics — assurance against leaks, relief from periodic repacking, quick opening and closing, and attractive appearance.

The ARCO Packless possesses all of these features and retains its leak-proof quality throughout the life of the heating system without ever requiring repacking. The first cost is the only cost. Therefore, the relief from packing expense makes it actually less expensive to the owner in the long run.

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Individualize your work by having your name etched in nickel on the ARCO Packless black dial. It will identify you with the satisfaction your customer is bound to derive from an ARCO Packless Valve Installation

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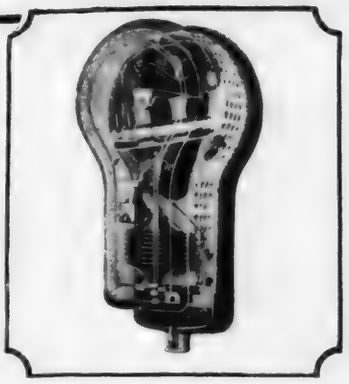

Mercoid Thermostat—Figure 21. Standard range 56° to 80° F. Operating Differential of 2°.

Mercoid Boiler Control—Figure 31. Pressure Type for Steam and Vapor Boilers.

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M-6

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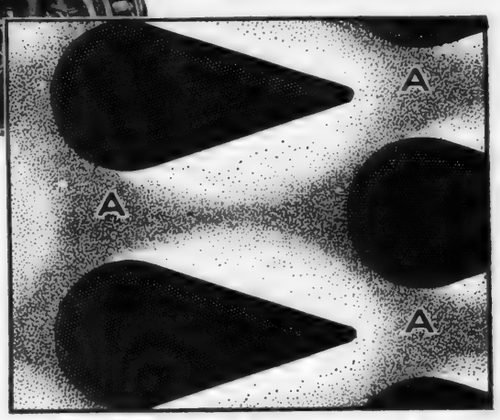

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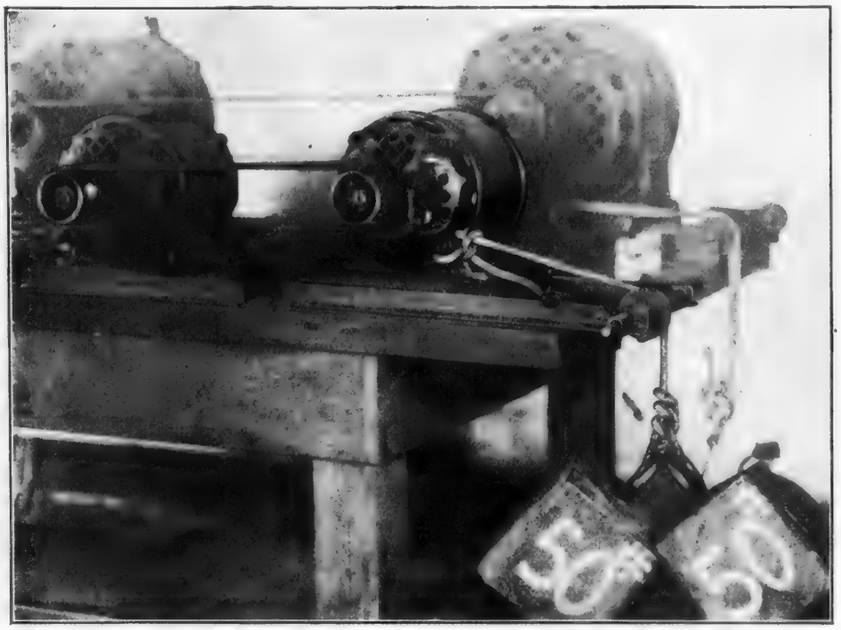

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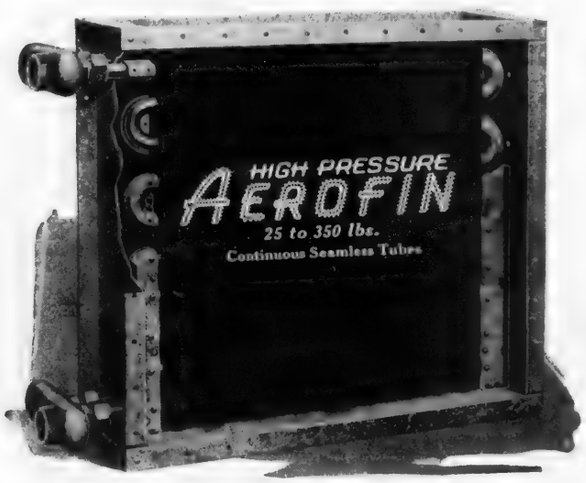

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Where Much is Required— Boilers of Steel

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The Heating and Ventilating Magazine

VOL. XXV — Reg. U. S. Pat. Off. Reg. Canadian Pat. and Copr't Off. — No. 1

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Conventions

HAVE you ever attended a meeting of engineers, sitting in your stiff-backed chair and looking through the cigar smoke at a speaker elucidating a fine technical point? And have you longed for that comfortable seat in the lobby where you know some of your friends are ensconced, swapping engineering and, occasionally, other experiences?

We dream of the day when some bright mind will devise a comfortable convention chair, when the air will be of that balminess redolent of Spring, when the speaker will tell his story crisply and well, graphically driving home his points, when necessary, with blackboard and chalk, when the program will not be so full as to choke off discussion at possibly its most interesting point and, finally, when abstracts of the papers, issued in advance, will leave no excuse to those present not to know what each presentation is all about.

A. V. Almquist

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The Progress of Heating and the Prevention of Heat Waste

Eleventh of a Series

Large Buildings Add To Problem

THE primitive home in the ground, the hut, the wigwam, the cabin, the great halls of the early Romans, despite crude and inadequate means of heating, presented far less of a problem than our present day mammoth, modern architecture does. ¶ Huge areas to heat, many floors, multiples of separate rooms and the greatly increased throngs of humans and their varying natures make heating today more difficult and costly than it used to be. ¶ Heavy heat must be kept constantly, and distributed long distances: at the disposal of the building's occupants. ¶ Immense tonnage of coal is required, intense warmth is carelessly allowed, and great waste of heat and fuel cost prevails. ¶ The Johnson System of Heat Control, its automatic regulation of heat and fuel consumption, is therefore an essential part of modern day heating, an economic necessity in present day buildings.

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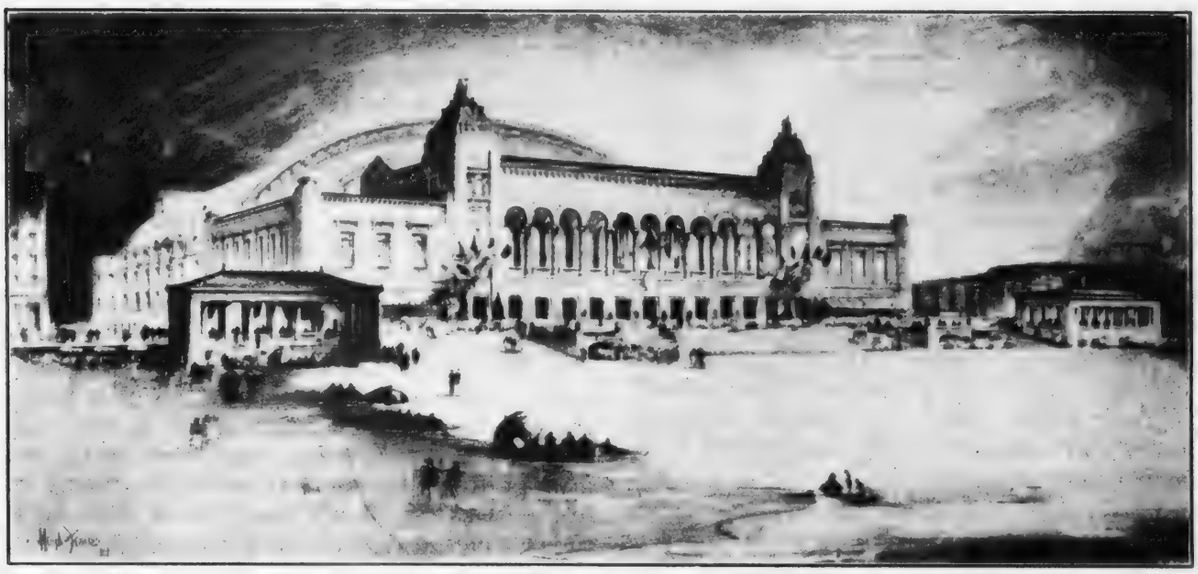
The Heating and Ventilating Magazine

A Monthly Journal of Engineering Progress

JANUARY, 1928



Lockwood, Greene & Co., Inc., Boston, Architect and Engineer. Riggs-Distler Co., Inc., Baltimore, Heating Contractor.

Atlantic City's New Convention Hall

Mechanical Equipment of the World's Largest Auditorium

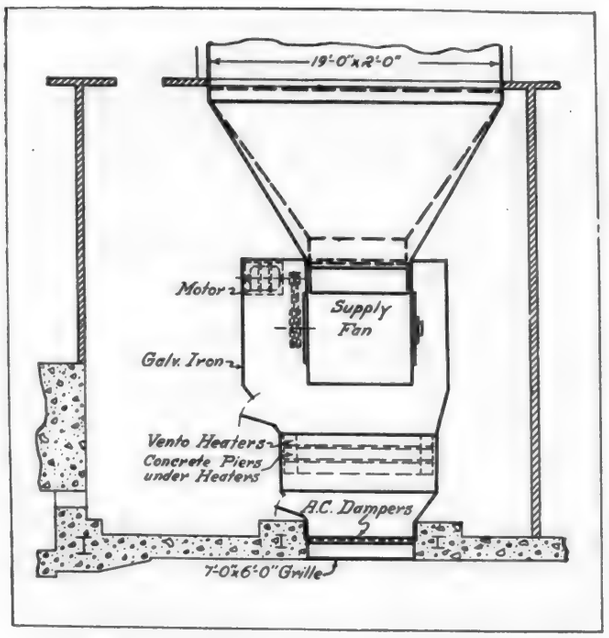
Details of Design for Atlantic City's New Convention Hall, Seating 40,000 People

THE realization that important American cities must have suitable halls to accommodate large gatherings has led Atlantic City, N. J., to build the greatest auditorium in the world, capable of seating 40,000 people. This building is 350 ft. wide by 650 ft. deep, on a lot of the same size, located on the Boardwalk between Georgia and Mississippi Avenues, and running back to Pacific Avenue.

Wood piles are used throughout in the foundations and the ground floor is of concrete beam and slab construction, designed to resist upward hydrostatic pressure and arranged to take care of the superimposed live load for exhibition space and garage purposes. The hydrostatic pressure is due to the close proximity of the ocean and to a light sandy soil.

Both boiler and mechanical rooms are on a lower level than the ground floor and occupy the largest and deepest excavation in Atlantic City. Heavy reinforced concrete mats, extra thick, are provided in the boiler-room portion to offset the enormous hydrostatic pressure at this lower level.

To support the main roof of the auditorium, ten



Plan of Fan Room No. 2 for Auditorium

pairs of three-hinged trusses, weighing 220 tons per pair and spaced 49 ft. apart, have been provided. Each truss has a clear span of 350 ft. and is 130 ft. high from the main auditorium floor. The trusses are the largest ever erected in a building of a permanent nature. All of the truss ties are built into and form a part of the main auditorium floor, which allows all framing attached thereto to move slightly under heavy wind loads and temperature changes.

Precast Gypsum slab forms the roof, supported by 6-in. channel purlins spaced about 6 ft. on centers. The walls between the trusses are solid brick and are wind-braced at intervals to stiffen and strengthen the structure.

It is interesting to know that 12,000 piles were driven and 1250 tons of steel reinforcement were needed for the foundations. There are 11,000 tons of structural steel in the superstructure.

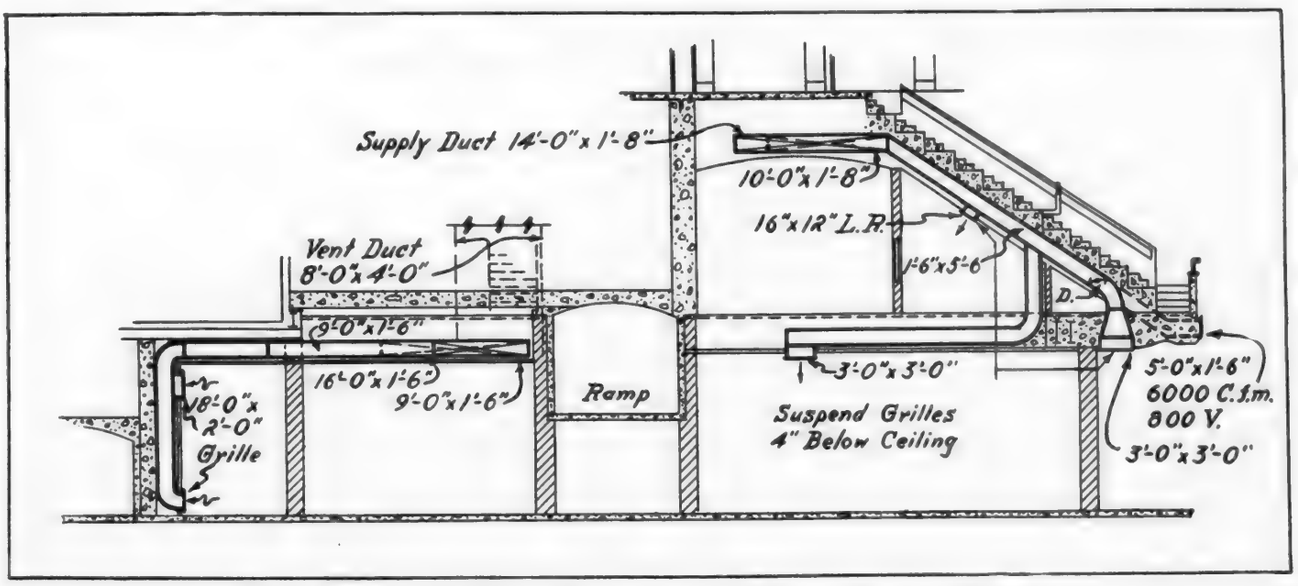
HOW FLOOR SPACE AND SEATING ARRANGEMENTS ARE DIVIDED

There will be 168,000 sq. ft. of floor space on the main auditorium and an additional space of 100,000 sq. ft. on the ground floor. The main auditorium will have a seating capacity of 25,500 on the floor and stage and 9500 in the balcony and committee rooms. It will be large enough for all kinds of industrial exhibitions and conventions, athletic games of all descriptions, and indoor circuses.

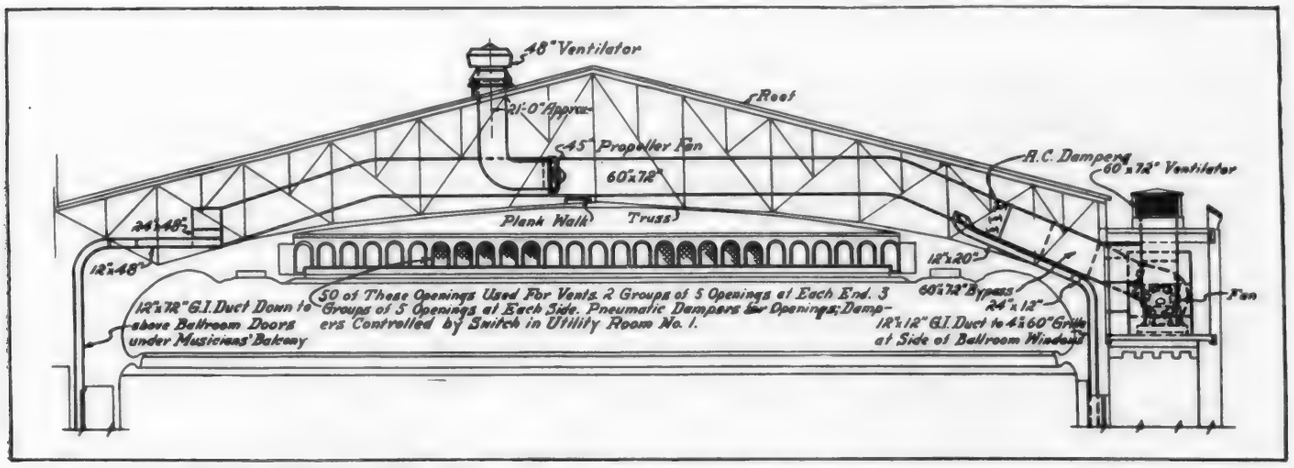
One of the notable features is that in a space of about 90 ft. x 200 ft., the floor can be covered in a comparatively short time with a sheet of ice for skating, and in a few hours, this ice can be removed and the floor again made ready for exhibitions and other events.

Surrounding the main auditorium are balconies which project about 38 ft. into the clear space, so planned that there will be about 15 ft. clear height from the main auditorium floor to the under side, to provide sufficient space for the display of exhibits over the entire floor. A series of rooms on the balcony level will be used for permanent exhibitions and as committee rooms during large conventions.

At the Pacific Avenue end of the auditorium is a large stage with complete property and dressing-room equipment. The stage is 110 ft. wide and 85 ft. deep with a width of 165 ft. between the wings, making it probably the largest in the country. Due to the fact that the building is to be used, not only for conventions of various kinds, but also for machinery exhibitions, the elevator problem was rather a difficult one. As one end of the building is devoted entirely to the stage and its various dressing rooms, it was necessary to provide adequate passenger elevator service and to furnish



Section Through Auditorium Gallery, Typical Air Supply Duct and Outlet


48" Ventilator
Roof
21'-0" Approx.
45" Propeller Fan
60"x72"
A.C. Dampers
60"x72" Ventilator
Plank Walk
Truss
24"x48"
12"x48"
18"x20"
60"x72" Bypass
24"x12"
Fan
50 of These Openings Used For Vents. 2 Groups of 5 Openings at Each End. 3 Groups of 5 Openings at Each Side. Pneumatic Dampers for Openings; Dampers Controlled by Switch in Utility Room No. 1.
12"x72" G.I. Duct Down to above Ballroom Doors under Musicians' Balcony
12"x12" G.I. Duct to 4 60" Grills at Side of Ballroom Windows

Section Through Truss Space Over Ball Room Showing Arrangement of Fan Rooms and Vents

means for handling countless numbers of chairs and quantities of stage scenery. Included in the elevator equipment are two large freight elevators of the vertical steel-screw type, each having a capacity of 50,000 lbs. There will be a separate freight elevator having a capacity of 4000 lbs. for handling trunks. A specially-designed organ lift will raise and lower the two organ consoles from the orchestra pit to the stage level.

In addition to the main auditorium, there is a large hall, 130 ft. x 185 ft. on the Boardwalk front of the building, which may be used for smaller conventions, art exhibitions, banquets and dancing. This hall will have a seating capacity of 5000 people and will include a stage, committee rooms and retiring rooms. Fronting the length of the hall is an arched loggia, 12 ft. wide, looking out on the ocean.

On the Boardwalk front, an arcade, 12 ft. wide, will be devoted to shops. The entrance lobby is a vaulted passage 50 ft. wide and about 125 ft. long, serving the main hall from the Boardwalk. Corridors lead from this lobby direct to the ramps which connect the upper and lower levels of the auditorium.

Bath houses for both sexes are provided on the ground level at the front of the building with direct access to the beach under the Boardwalk. On the same floor, space has been provided to accommodate 400 automobiles.

HEATING AND VENTILATING EQUIPMENT

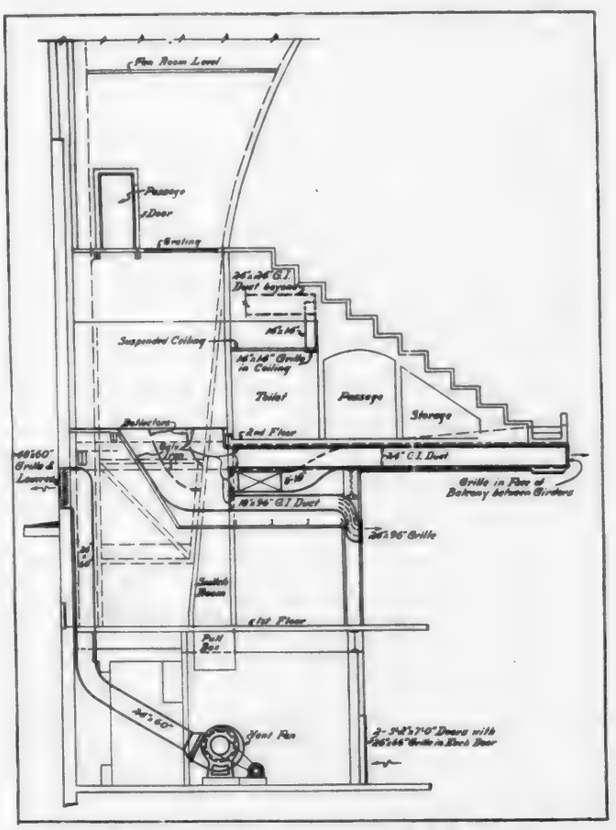
In meeting the heating and ventilating requirements of such a large interior, it was decided to heat the main hall and ballroom principally by the air which is used for ventilation, with provision for recirculation in the interest of economy. Direct radiation is provided for the main-entrance lobby and entrances on the side of the building and is supplemented by recirculating air-warming units. All of the stores, offices, corridors and stairways are equipped with direct radiation.

Included in the ventilating equipment are 31 motor-driven fans, having a normal capacity of 1600 tons of air per hour. Seventy-five vent fans, capable of discharging 2900 tons of air per hour, are located at points in the building shown on the plans. For fan operation, 525 electric H.P. is required.

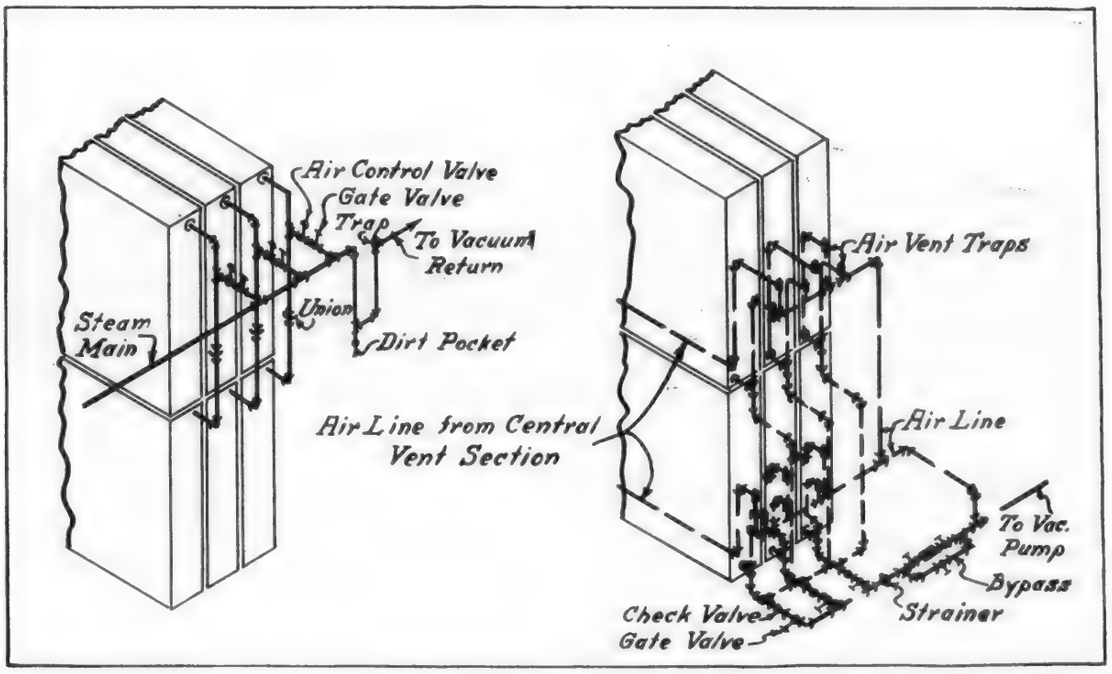
In the distribution of the fresh air supply, 72% will be provided for the main hall, 11% for the ground exhibition hall and garage, and 6% to other parts of the building. These quantities provide several changes of air per hour.

FAN ROOMS LOCATED BETWEEN ROOF TRUSSES

Nine fan rooms for housing the supply and vent fans and heaters for the main-hall ventilation are located on each side of the hall between the main roof trusses, 56 ft. above the main floor. The ap-



Typical Section Through Balcony of Ball Room Showing Air Supply and Exhaust Equipment



Typical Supply and Return Connections to Heaters Two Tiers High

paratus contained in each of these 18 fan rooms constitutes a complete air supply and vent unit in itself, thus providing maximum flexibility.

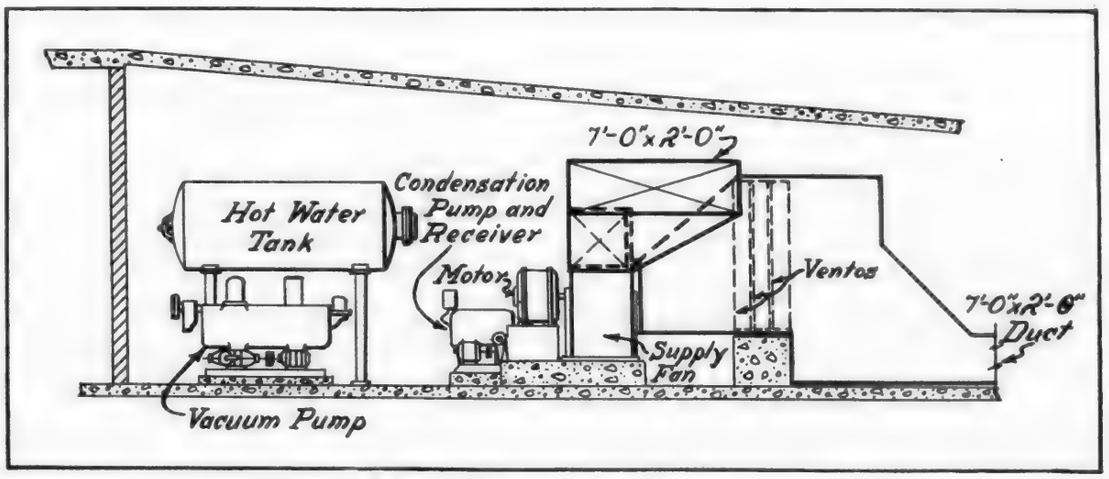
Fresh air from the truss fan-room is discharged through grilles at the face of the balconies and over corridor doors under the balconies. Openings through the sides of the ceiling beams formed by the trusses connect to the truss spaces within. These spaces form exhaust air ducts, leading to the vent mains in the fan room. Air flowing through these spaces serves to remove the heat generated by flood lights which illuminate the ceiling.

Specially designed propeller-type fans located in ten pent houses on the roof furnish additional summer ventilation. With this supplementary ventilation, the air in the occupied zone of the vast enclosure can be changed every seven minutes.

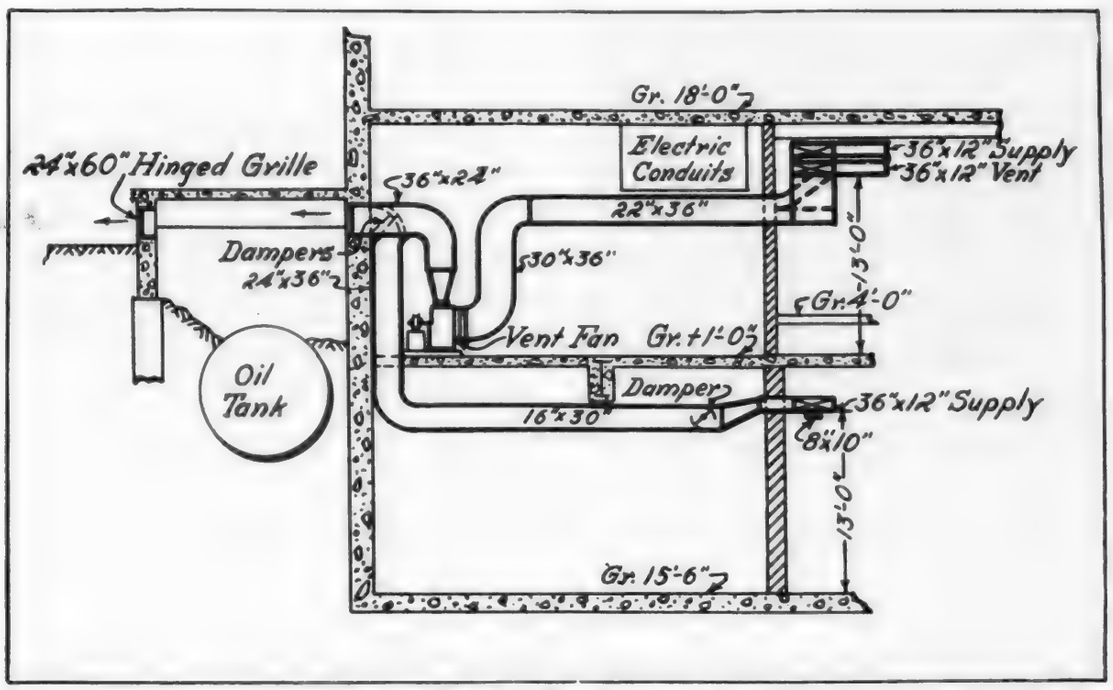
The principal fan motors and automatically operated dampers throughout the building are controlled from two central stations, one for the boiler room end of the building and one for the main hall and garage. An electrically-operated temperature indicating system, with central operating panels at the two stations mentioned, enables the operator to determine instantly and at any time, the inside temperature at 117 locations within the building, as well as the temperature outdoors.

In addition to the arrangements for furnishing electric current, telephone service and water facilities to exhibitors, steam mains with numerous valve outlets also have been provided for the supply of high or low-pressure steam and compressed air.

Three Sterling water-tube boilers of 1490 rated H.P. capacity provide steam for the heating system, for heating water and for exhibition purposes. The boilers are oil-fired and may be operated at 150% overload. Underground oil-storage tanks of 40,000-gal. capacity are so placed that they can be filled directly from tank cars. Coal bunkers are provided in anticipation of a possible change to coal for fuel if conditions should arise making this change necessary or desirable.



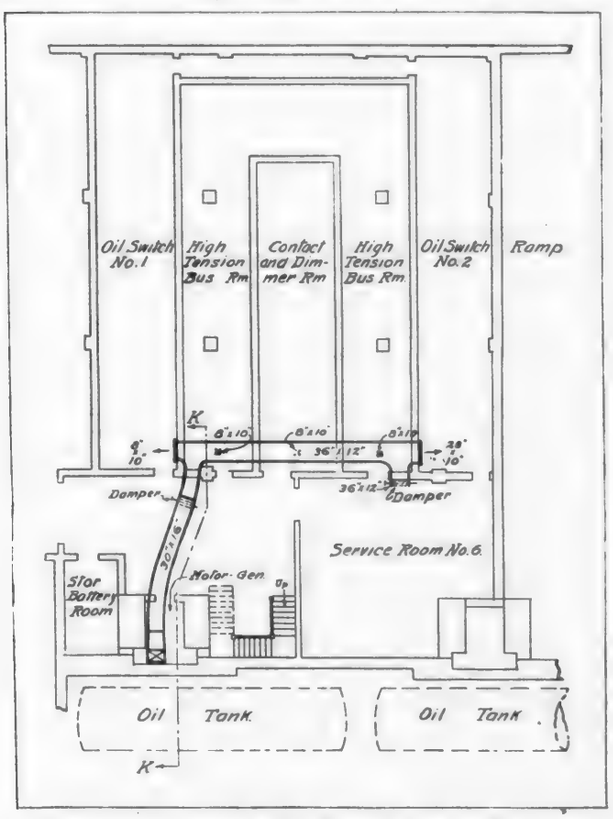
Section Through Pump Room No. 2



Section on Line K-K (See illustration below)

Lockwood, Greene & Co. Inc., of Boston, is the architect and engineer for the building. The M. B. Markland Co., Atlantic City, has the general construction contract, and the Waterproofing Co., Boston, the contract for waterproofing. This is characterized as the largest contract of its kind ever let in the United States, and perhaps in the world.

The ice skating rink will be built by the Pennsylvania Engineering Co., Philadelphia. All of the heating equipment is being installed by the Riggs-Distler Co., Inc., Baltimore. Other contractors are: Plumbing, W. G. Cornell Co., Philadelphia; electrical work, Electrical Equipment Co., Atlantic City; fire protection, Globe Automatic Sprinkler Co., Philadelphia.



Ventilating System for Oil Switch, Bus and Dimmer Rooms

Berlin Municipal Heating Works

INFORMATION has been received in London recently that the Berlin Municipal Electricity Works has put into operation the first great municipal heating works, which represents the largest undertaking of its kind. Up to the present time only a quarter of the projected works has been started. The exhaust steam of the municipal electricity works, at two atmospheres pressure, is passing into a net of street mains which has a length of 5,000 meters and which has been put down in three months. Most of the buildings are connected up to a circular main of 350 mm. diameter, while industrial establishments are supplied by a main of 450 mm. diameter. The condensation water is pumped back into the power station. The mains are capable of a certain amount of movement, being placed on rollers at the bottom of the conduit. A coating of kieselguhr, surrounded by a layer of cork 50 mm. thick, forms the heat insulation. Inspection shafts are situated at distances of 50 to 60 meters, and in these the regulating valves and appliances are placed. The pipes in the conduit have no screw couplings, being welded together. The system requires no attention in the buildings to which it is connected, except the regulation of the valve. Up to the present thirty-two buildings have been connected up, including one town hall, one theatre, one hospital, six schools, seven tenement houses, and fifteen business premises.

Baltimore Home in Which 850 Sq. Ft. of Hot-Water Radiation Is Heated by a Coal Boiler With Special Gas Burners

Special Gas Burners in a Coal Boiler Supply Hot Water for 1100 Sq. Ft. of Radiation in this Home

Gas Conversion Installations Can Be Successful

Experience of Gas Company in Baltimore, Extending Over Ten Years, Shows Feasibility of Firing Conventional Water and Steam Boilers With Gas

By Eugene D. Milener

Formerly Supervisor, Fuel Sales, Consolidated Gas, Electric Light & Power Company of Baltimore.

FEW will deny that the thought of heating houses automatically is beginning to thrill the American public. Automatic heating plants have for years been the dream of countless thousands as they unwillingly toiled, serving their annual seven months' sentence at distasteful labor, imposed upon them by a taskmaster who daily said, "Do as I require or freeze."

We are in the beginning of a period when the cry for relief is being answered. Various means now are employed for which are made claims of perfection in various degree. Gas, oil and street steam vie with each other in their efforts to ride to the crest of the fast approaching wave of public acceptance of automatic heat. Street steam is in a class by itself because its many advantages are restricted, for the time being at least, to a limited number of cities.

The battle is on between gas and oil—a cleanly contested battle, to be sure, but an earnest one nevertheless. Gas and oil have many points in common, such as heating by means of ordinary steam, hot-water and warm-air systems; adaptability to thermostatic control, and lack of constant furnace tending. This being the case, it is only natural that many problems of how to apply gas and oil efficiently and economically should present themselves in the same manner to the leaders of both camps.

It is interesting to record the manner in which the gas men and the oil-burner men have approached a solution to their common problem, viz., the task of leading a people to change its national fuel. Leaving out the details of thermostatic controls, motive power, etc., we see that, by-and-large, the gas man has developed boilers and furnaces of which the burners are among the least important part, while the oil man has exercised his talents by perfecting his burner, and has used available boilers and furnaces, designed for solid fuels, chiefly as he has found them.

Perhaps, both are right, but again, both may be wrong to an alarming extent. It might be that a compromise on the part of both ultimately will develop. Who knows? One thing we all realize, and that is as soon as one attempts to market automatic heat he is tempted to use existing coal boilers and is strongly urged to do so by his prospective customers. The oil men have taken this situation as they have found it, and there is no doubt that the phenomenal growth of oil heating is due, in a large measure, to this fact. It might be argued that an entirely new gas boiler, including burners, fre-

quently can be installed at a lower price than an oil burner can be put into an old coal boiler. Granting that this is true, there is a strange psychology that causes people to think that they are the loser when they are asked to junk their old boiler. The old boiler or furnace obviously was designed only for solid fuels, and no doubt a greater efficiency is obtainable with a fluid-fuel boiler, but the average home owner rarely ever wants to throw away his original plant.

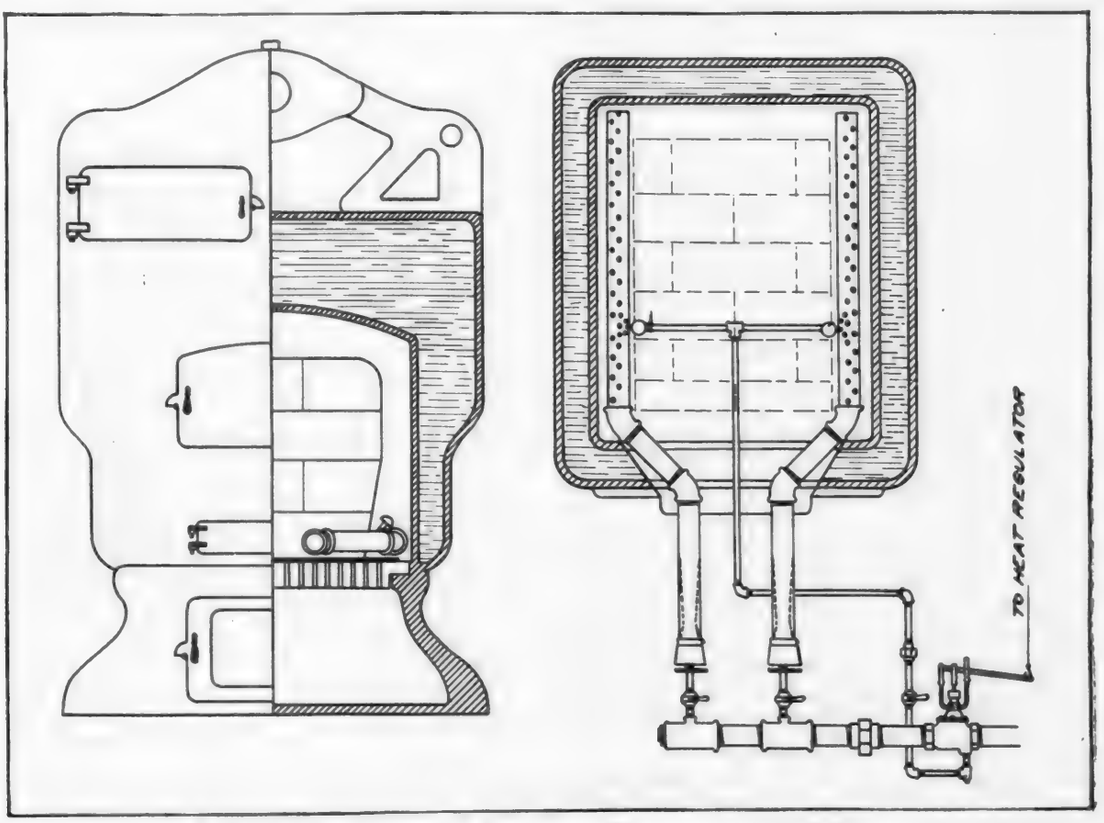
A great deal of grief has resulted from attempts to use solid-fuel boilers when changing to automatically-controlled gas or oil heat. On the other hand, many highly successful conversion installations can be pointed to. This is more true as regards oil than gas, because with oil one can afford to operate at a slightly lower efficiency than with gas, due to the lower cost per million B.T.U. The gas men have been ultra-conservative, and, except where natural gas is available, have advocated only the use of boilers and furnaces designed for gas; where such a policy has been followed there has been little grief. There now are being built a number of boilers for use with oil burners, and those who advocate their use see in their adoption a cure-all for many of the past troubles of the oil-burner men.

Oil-burner men see in the general adoption of oil-fired boilers a hindrance to the rapid growth of their business. The gas men see in the use of coal boilers a danger to the sound growth of gas heating. It is interesting to note that the percentage of oil boilers to oil burners is just about the same as the percentage of converted coal boilers is to the total number of gas heating jobs. In both cases this percentage is very small. The use of oil boilers will grow as the causes for past troubles are further analyzed, and as the public becomes more used to depending upon a heating plant that cannot be changed back to coal on an hour's notice.

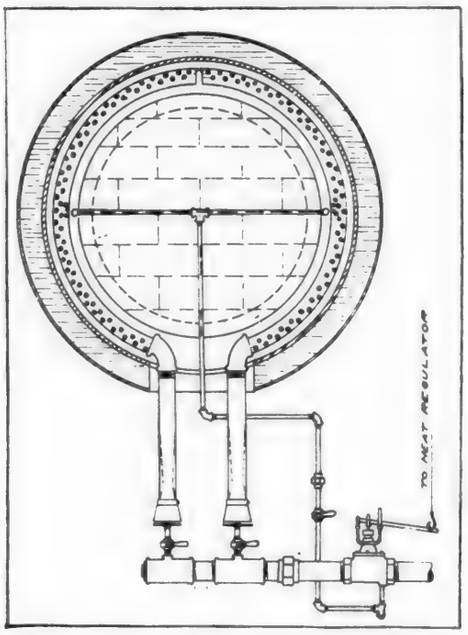
SUCCESSFUL GAS CONVERSION OPENS TREMENDOUS FIELD

On the other hand, is the gas industry making a mistake in not utilizing more of the coal boilers now installed in the homes of their prospective customers? Will not the general use of gas as a house-heating fuel become greatly speeded up if the necessity of replacing the customer's coal boilers and furnaces is removed? Undoubtedly this is the case, but there is one thing that is preventing this movement from taking place, and that is the belief that the unit cost of heating by means of converted coal boilers and furnaces is greater than with gas designed equipment. In the great majority of instances this is true, but suppose it is not true in 20% or 30% of the cases. If such is the fact, then the gas industry is overlooking a big bet, because if 5% or 10% of the people who might consider automatic heat are, through this extra inducement, turned into consumers, the results will be stupendous.

The writer does not want to be misunderstood as advocating the promiscuous conversion of coal boilers and furnaces, as he believes the backbone of the gas-heating business always will be gas designed equipment, and he further believes that the



Special Burners Adapted to Rectangular Conversion Jobs in Baltimore



A Special Shaped Burner as Developed in Baltimore for Round Boiler

gas boilers and furnaces will more and more deserve the lion's share of the business because they will be made increasingly more suitable for their task. On the other hand, where certain technical and economic conditions are met in converting coal boilers, they are the means of profitably selling millions of cubic feet of gas yearly.

Briefly, these conditions are that the converted plant shall be of sufficient capacity to properly heat the building, shall be subject to complete automatic and thermostatic operation, shall contain the features recognized as necessary to safety, and shall heat a building at an overall cost satisfactory to the owner. Strange as it may seem, a converted coal boiler might meet any one of the above conditions and not the others, and that has been the cause of their apparent unpopularity up to this time. They can be considered a real factor in gas heating only when they meet *all* of the conditions in a sufficient number of cases to build up a volume business.

VITAL FACTORS IN GAS CONVERSION

Let us consider these requirements in detail. To be of sufficient capacity properly to heat a building, the burners in a converted boiler must burn enough gas to transmit enough heat to the water, steam or air to make up for all heat losses in the building and to have a reserve for quick heating, etc. This heat transfer in the boiler or furnace can take place at a high or a low efficiency, the unit cost of heating varying in inverse ratio to the efficiency. On the degree of thermal efficiency depends, to a very large extent, the ultimate satisfaction or dissatisfaction given by converted coal furnaces. The efficiency is affected by the design and location of the burners, the flue travel and, most important of all, the area of the heat-absorbing surface. A large heat-absorbing surface compared to the radiation supplied is of prime necessity, and after that follows the necessity of properly directing the heat travel.

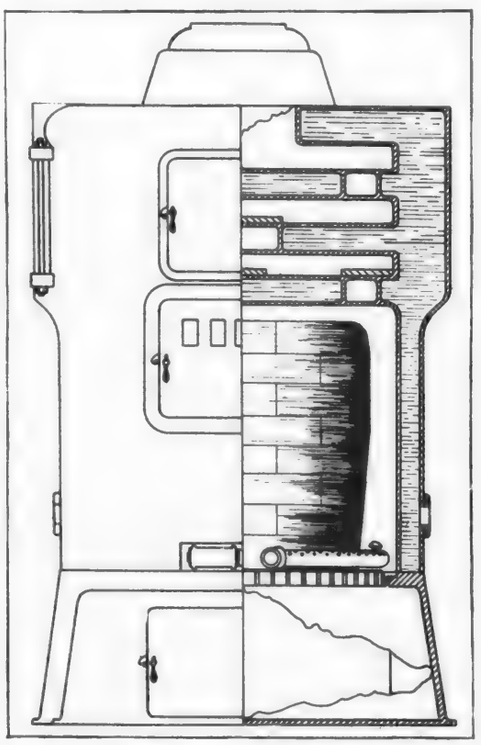
BURNERS BUILT TO FIT EACH BOILER

A definite method was evolved to secure the best results from burners built, in each case, to fit the particular boilers in which they were to be installed. This consisted in shaping the burner pipe to the periphery of the horizontal cross-section of the fire pot; then building, of refractory brick, a solid volume resting on the grate, with its walls just within the lines of the burner pipe or pipes. This reduced the combustion volume to a comparatively thin annular space around the water-leg of the boiler, and the brick centerpiece, absorbing heat from the flame and from the products of combustion, radiated directly to the walls of the boiler.

The sketches give a good idea of this practice, showing burners applied to square and round boilers and furnaces.

Converted gas-boilers and furnaces must of necessity be susceptible to complete automatic and thermostatic control. Fortunately, heat regulators and interlocking control devices are on the market and are of the same construction as those used to control the actions of boilers and furnaces designed for fluid fuels.

The whole question, therefore, boils down to this: Can the overall cost of heating with gas burners in coal boilers be brought down to a point comparable with the cost of heating with an oil burner or with gas designed boilers and furnaces? Much talk and some figuring have been done in an at-



Special Gas Burner Applied to Round Cast-Iron Boiler Showing Use of Refractories in Combustion Chamber

TABLE SHOWING THE COST OF HEATING VARIOUS DWELLINGS WITH GAS BURNERS INSTALLED IN COAL BOILERS, IN BALTIMORE, MD. 500 B.T.U. GAS—AVERAGE RATE 66C PER THOUSAND CU. FT.

HOT WATER

House Number	Direct Radiation, Sq. Ft.	Date Installed	Cost, 7 mo. Season 1924-25 4089 Degree Days	Cost, 7 mo. Season 1925-26 4775 Degree Days	Cost, 7 mo. Season 1926-27 4301 Degree Days	Description	Tons of Coal *
1	850	1917	$319.20	$383.33	$308.47	3-story, brick, corner	12
2	1100	1916	328.93	372.35	351.28	13 Rooms—2 Baths Stucco Cottage	—
3	401	1918	.....	228.88	225.24	9 R.—1 B. Brick	10
4	350	1920	174.54	175.98	137.37	8 R.—1 B. Brick	—
5	640	1917	291.16	345.55	327.30	2½ Frame	12
6	1100	1916	.....	341.53	357.65	10 R.—3 B. Brick	—
7	300	1917	117.73	130.41	117.98	Frame Cottage	6
8	850	1917	255.39	308.77	336.13	9 R.—2 B. Frame	—
9	585	1917	185.08	249.36	227.97	3-story Brick	10
10	1250	1916	663.23	827.47	724.70	3-story Brick	—
11	471	1917	180.65	236.48	197.88	3-story Brick	—
12	525	1916	235.52	248.18	234.40	8 R.—1 B. 3-story Brick	—
13	720	1917	289.92	342.39	324.16	3-story Brick	13
14	500	1917	.....	176.88	172.07	9 R.—2 B. Brick	10
15	775	1916	397.04	320.65	292.84	9 R.—3 B. Brick	—

*This column shows quantity of solid fuel used prior to conversion.

STEAM

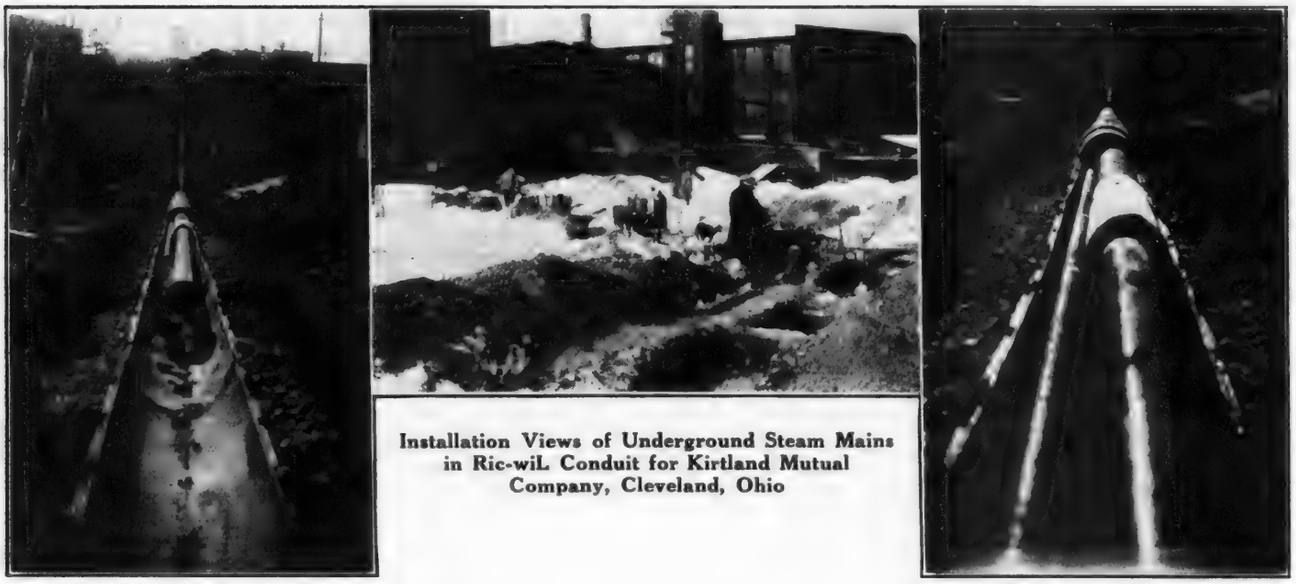
House Number	Direct Radiation, Sq. Ft.	Date Installed	Cost, 7 mo. Season 1924-25 4089 Degree Days	Cost, 7 mo. Season 1925-26 4775 Degree Days	Cost, 7 mo. Season 1926-27 4301 Degree Days	Description	Tons of Coal
16	195	1920	$115.19	$157.74	$136.24	6 Rooms—1 Bath Brick	6
17	200	1917	132.71	189.92	175.08	Brick	5
18	713	1925	.....	422.85	329.68	9 R.—3 B. Brick	12
19	271	1926	.....	.....	201.52	8 R.—1 B. Brick	9
20	275	1917	159.92	187.54	170.97	8 R.—1 B. Brick	—
21	300	1917	108.97	119.35	114.86	9 R.—1 B. Brick	—
22	1100	1916	.....	341.53	357.65	10 R.—3 B. Brick	12
23	400	1916	237.84	244.14	280.75	6 R.—1 B. Frame	—
24	400	1918	253.13	315.02	292.78	Brick	—
25	385	1918	181.55	214.87	181.62	10 R.—1 B. Brick	—
26	230	1917	130.83	205.75	115.64	7 R.—1 B. Brick	—
27	440	1917	191.96	246.84	237.13	Brick	—
28	775	1916	397.04	320.65	292.84	9 R.—3 B. Brick	—
29	235	1917	213.06	237.12	229.24	8 R.—1 B. Brick	9

tempt to answer this question. Final figures of operating costs over a period of years, to my mind, are the only answer. In order to shed some light on this subject I have picked at random a number of houses that successfully have been heated with gas burners in coal boilers for a number of years, and am showing above a tabulation of salient data.

The above figures indicate that *if all conditions are right*, satisfactory operating costs will result from the use of gas burners in coal boilers. Before converting coal boilers every point that I have mentioned should be carefully checked, as well as any local condition that is likely to have a bearing on the final result. The engineer passing on converted jobs must be prepared to say "NO" quite frequently, but if 5% or 10% of the coal boilers in use are found to meet *all* requirements the field for gas heating easily is tripled.

Use of Ventilated Sheeting Increasing in Britain

A SPECIAL type of corrugated sheeting known as Venteolite has been introduced in Britain. The reason for its popularity is obvious, as sheds built with this form of sheeting or roofed with it let in the air and the light, but at the same time keep out the rain. Roofs and sides and ends of buildings covered with Venteolite sheets have no dark corners, and owing to the formation and large number of the patent slot holes, there should be no drafts. For the same reason the sheets are suitable for buildings where there are fumes, dust, gas, smoke, steam or heat in the atmosphere. Small ridged slots are placed on the top of each corrugation. In exposed places where windows will not withstand the elements the material also is used.



Installation Views of Underground Steam Mains in Ric-wiL Conduit for Kirtland Mutual Company, Cleveland, Ohio

Group Heating of Industrial Plants

How a Number of Cleveland Factories Combined to Obtain Steam Heat from the City's Pumping Station

By George D. Farnham

A SYSTEM of underground heating mains recently installed in Cleveland, O., has many interesting features not often encountered. Several industrial plants, located along streets in a typical factory district near the Kirtland Pumping Station—owned and operated by the City of Cleveland, as part of the city water system—were connected by an underground steam distributing system, taking live steam direct from boilers in the pumping station.

As part of the preliminary work, before any construction was started, it was necessary for the various industrial concerns (in this case, five) to be assured that the city would co-operate and sell the steam after the steam line was laid.

A mutual corporation, organized for no profit, was formed to install the steam line, which extends through city streets, also under the New York Central Railroad, five main high-speed lines of tracks and under the Pennsylvania Railroad freight track; also, at certain points, running through properties of factories not subscribing to the mutual company, from which easements had to be obtained.

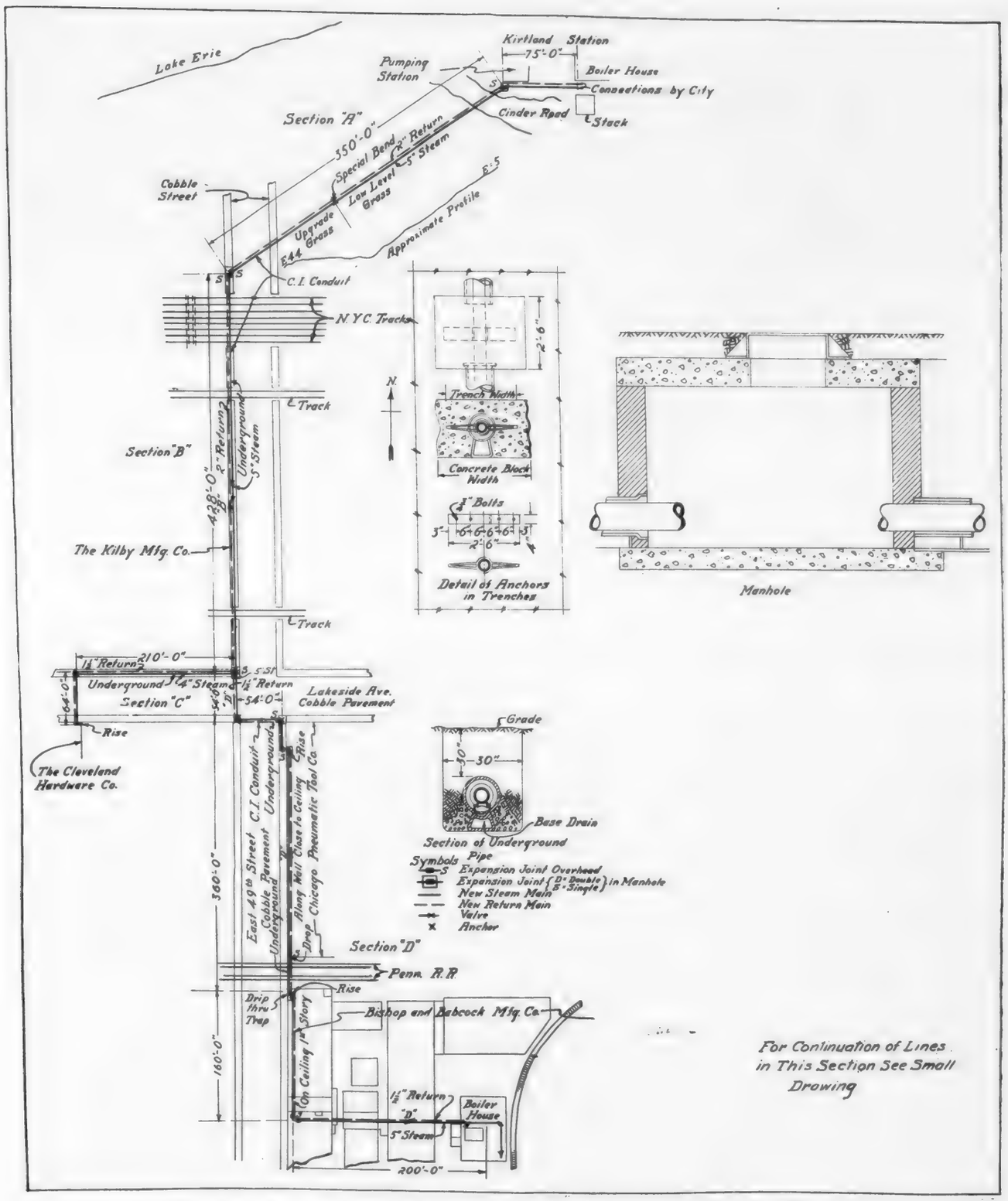
Based on estimates of cost of installation for the entire main steam line, and it might be well to state that this cost was for installing the main steam line only to points of entrance of the various subscribing plants, and making allowances for location of plants in relation to the pumping station, each plant subscribed and paid into the treasury of the mutual company its proportionate share of the total cost, and agreed to make, at its own expense, the necessary connection from the new steam main to central distributing point of heating system.

PLANTS FORMERLY OPERATED BY HIGH-PRESSURE BOILERS

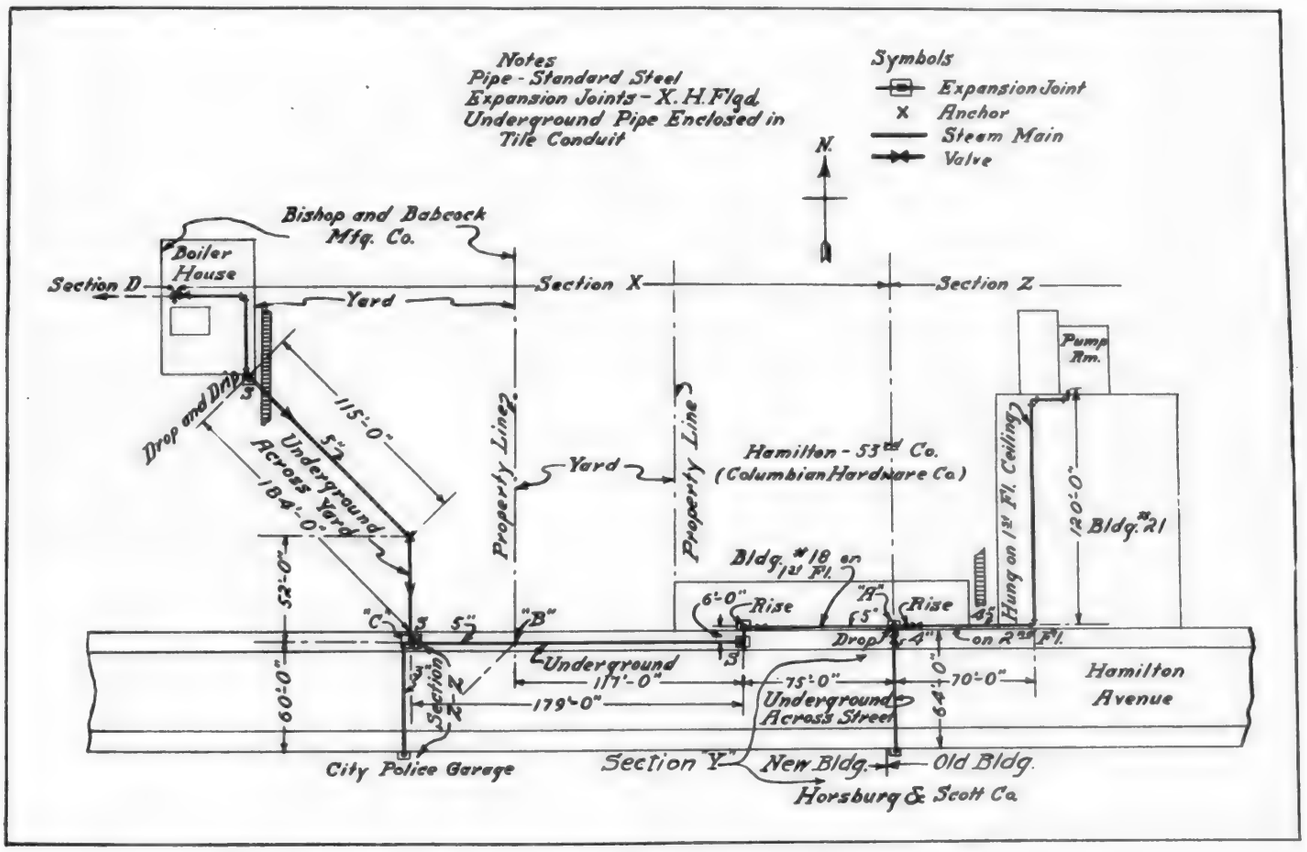
Each of these plants formerly had been operated by high-pressure boilers, with generators for power. Following the trend of the times, power was later purchased from the Cleveland Electric Illuminating Company, which necessitated the operation of high-pressure boilers for heating only. Also, as the plants had been in operation for some years and were consequently antiquated, they did not comply with regulations of the city smoke commissioner, who is very active in that city.

It also should be stated that the operation of the pumping station is at a maximum in summer and has a reserve in winter, due to less consumption of water. By selling steam, the city could operate its boilers nearer maximum efficiency in winter and could sell the steam at a low rate, to a great advantage.

Preliminary figures indicated that, by closing down individual plants, dispensing with labor, coal, ash handling, repairs, etc., steam purchased from the outside sources would effect a saving of a very material amount, and this has proved to be the case, as for one of the largest users the saving for six months of operation paid for its share of the original investment.



Details of Steam Distribution System for Kirtland Mutual Company, Cleveland, O.



Continuation of Steam Distribution System, Kirtland Mutual Company, from Section D

STEAM LINE DESIGNED TO SUPPLY 100,000 SQ. FT. OF RADIATION

The steam line was designed to supply 100,000 sq. ft. of radiation. Steam pressure at the pumping station is 175 lbs., 100° F. superheat maximum, on the outgoing line. This pressure is reduced, in each plant, through pressure-reducing valves, to 3 to 5 lbs. pressure for use in heating systems.

Standard pipe with extra-heavy steel flanges was used. Considerable welding was done to avoid obstructions in streets, etc., and expansion joints of extra-heavy guided type were installed. The underground installation was Ric-wiL tile conduit, with base drain, with 2-in. 85% magnesia covering, wrapped with roofing paper jacket, for steampipe covering.

Drips were installed in convenient manholes, discharging to a return line which extends from two of the plants back to the pumping station. After considerable experimenting, trouble was eliminated by using a special trap on these drips. This trap operates on an inverted bucket principle, with inlet at the bottom of the trap. The water seals the incoming line, thus preventing evaporation due to superheat in steam. Tests of these traps after installation indicate very little condensation in the main steam line on account of superheat in the steam.

The return line, as already mentioned, was installed in the same conduit with the steam line for a portion of its length. It was calculated that the plants at the extreme end of the line could not return condensation economically, owing to distance, and rise and fall in the lines, due to structural conditions. The portion of return water going back to the pumping station is from approximately one-half of the system and falls by gravity, after being discharged from the vacuum pumps, to a feed-water heater in the pumping station.

Economizers or heat extractors were installed on the main return lines from the heating systems, before discharging to meters, to heat service water used by wash sinks, etc. By this arrangement there is no cost for heating service water, as the heating is done by condensation from the heating systems, the heat in which otherwise would be wasted.

METHOD OF CHARGING FOR STEAM

A flow meter at the pumping station registers the total outgoing steam. Condensation meters were installed in each plant. Each subscriber pays according to his own condensation-meter reading, and also according to a percentage of the line loss, as indicated by the difference in readings of the main flow-meter and the total of all readings in condensation meters. This line loss was found to be about 5%. Thermometer wells were installed at several points in the steam main to determine the steam temperatures.

Several tests of steam conditions were made, a typical one showing the following results:

(*Continued on Page* 81)

An Original Design Submitted in Picture Theater Contest

Fan, Ducts, Mushrooms and Gravity Ventilators All Incorporated in a Single System by One Competitor

A DESIGN for ventilating a moving-picture theater, entered for competition in THE HEATING AND VENTILATING MAGAZINE contest and which shows great care in working out, was submitted by James T. White, of 310 North 32nd St., Louisville, Ky. The design only escaped capturing one of the prizes by a small margin. Unfortunately, careful analysis of the various features incorporated seems to indicate that, while the elements themselves are absolutely beyond criticism, the method of combining them is not.

The scheme as proposed consists of taking air into the building through a 24-sq. ft. fresh-air shaft (see Figs. 1, 2 and 3), drawing it through a heater, and a 7-ft. air washer by a fan, and discharging it through and under a reheater into a plenum chamber from which ducts, with openings both above and below the horizontal partition in the plenum chamber, convey it to registers in the side walls, as indicated in Fig. 1. The exhaust air leaves the theater through the mushrooms in the floor and finds its way over to the vent shaft, which has 12 sq. ft. area and seems to depend on the fan pressure exerted on the building for its moving force. This also is shown in Fig. 1 and is the way the system is intended to operate in the winter.

In warm weather a totally different method is pursued; while the fresh-air supply still comes in from the 24-sq. ft. fresh-air flue and passes through the dead heater and active air washer to the fan, the whole duct system is dampered off, and, by means of extra dampers in the wall of the cold-air

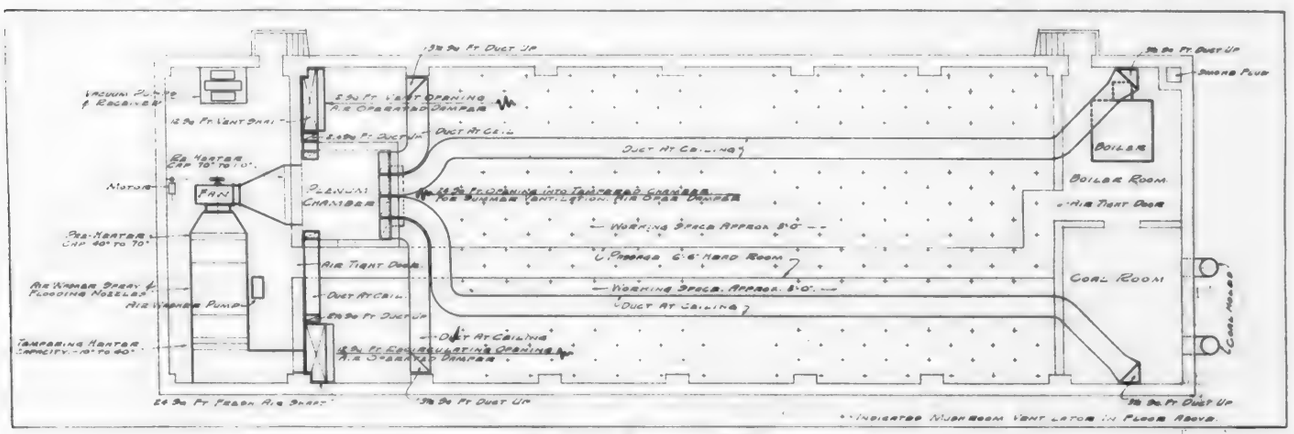


Fig. 1. Basement Plan

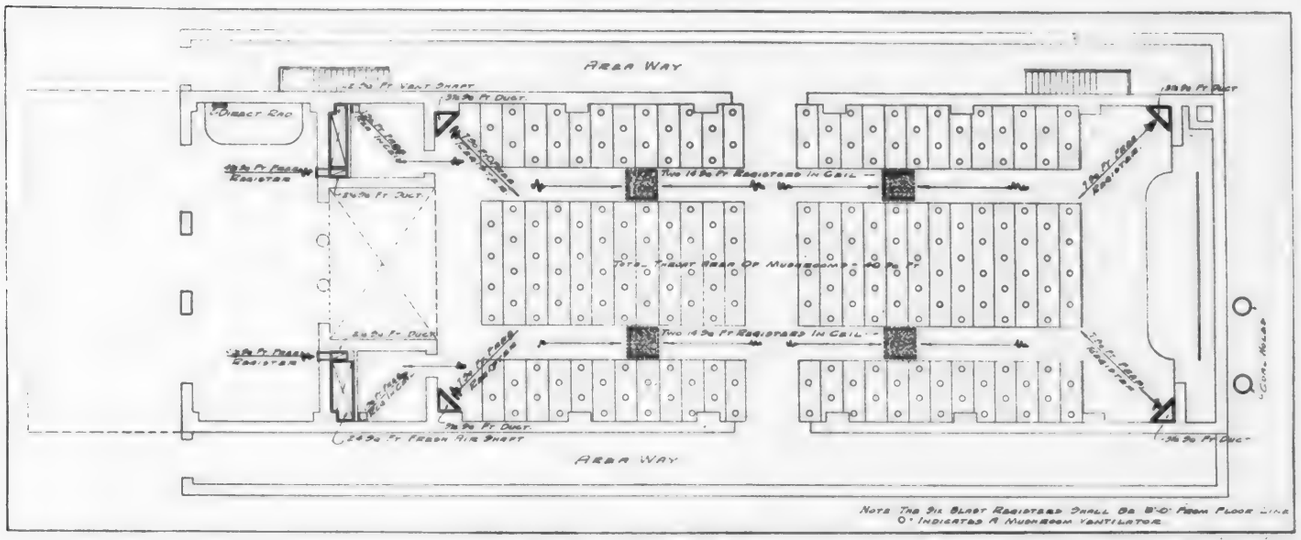

AREA WAY
12 Sq. Ft. VENT SHAFT
DIRECT RAD.
24 Sq. Ft. DUCT
Two 14 Sq. Ft. REGISTERS IN CEIL.
24 Sq. Ft. FRESH AIR SHAFT
AREA WAY
NOTE THE SIX BLAST REGISTERS SHALL BE 8'-0" FROM FLOOR LINE
INDICATES A MUSHROOM VENTILATOR

Fig. 2. First Floor Plan

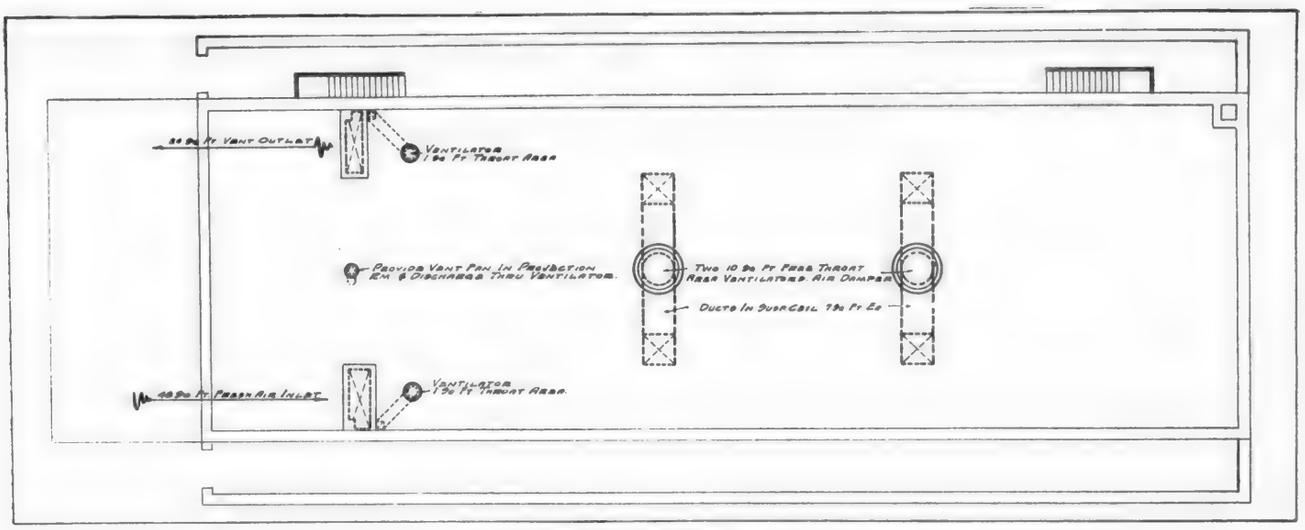


Fig. 3. Roof Plan

portion of the plenum chamber, all the air is allowed to pass out under the theater floor and up into the theater through the mushrooms. At the same time the warm-air exhaust is allowed to find its way out of the theater through the four main ceiling exhaust-registers, these registers being constructed as part of the ceiling work and connected up in pairs to the ducts, which terminate in two roof ventilators of the gravity type, each having 10 sq. ft. free area.

Now there are several points about this layout which the judges took into consideration in awarding the prizes. The first is the fact that, in this arrangement, an air-tight door is shown opening directly from the boiler room into the long corridor passing lengthwise under the theater floor. This door should never have been contemplated and a solid wall would have been little enough protection to the audience from fire hazard originating in the boiler room. It would have been even better to have located the boiler room outside of the building. With either of these revisions the long passage could have been omitted.

Another element which could have been improved is the location of the chimney in the small space allotted to the stage, whereas it could just as well have been placed on the outside of the building and in that location would not have introduced complications in the matter of stage space. Even more objectionable, from an efficiency and cost standpoint, is the placing of the heaters at the opposite end of the building, thus necessitating piping all of the steam from one end of the building, where it is generated, to the other end, where it is used.

It is questionable if the use of a plenum chamber in this installation is necessary or desirable; it is, of course, possible to use such a chamber just as it is shown, but the purpose of a plenum chamber with a horizontal partition having warm air on the top of the partition and cold air on the bottom is usually for securing temperature control by varying the air temperature in the different ducts leading off from the plenum chamber. In this case all the ducts—with the exception of two small 2¼ sq. ft. ducts going to the lobby where exact temperatures cannot be secured anyway—go to the theater and enter the same room or space. Consequently there is nothing to be gained by being able to control the temperatures of these ducts separately.

It also will be noted that this system is not a split system but is simply common "hot-blast" as far as the heating is concerned; this makes it necessary to run the fan in order to heat the building, which is not so economical as to use direct radiation, nor does it heat the building with the same promptness as when direct radiation is used. In other words the system as shown would require more electric power and be slower to respond to temperature requirements than if a split system were used.

For good humidity control it also would be advisable to use a 9-ft. air washer instead of the 7-ft.

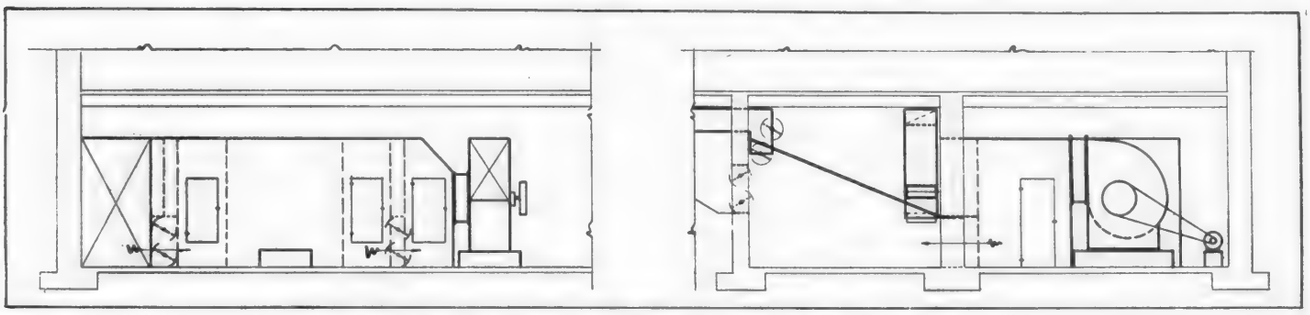


Fig. 4. Details Showing Fan, Washer, Heaters and Plenum Room

length, and it is also a debatable question if, in a theater as small as this one, both upward and downward ventilation are necessary. If only downward air movement were contemplated, to be used in both winter and summer, the ceiling registers, roof ventilators and attic galvanized piping could all be removed; if upward ventilation could be used all the year around, the plenum chamber side-wall registers and all duct work between the two could be omitted.

Taking all the above into consideration it was the opinion of the judges that the system could not be called ideal, but at the same time it was far ahead of what might be termed a competitive installation, where the most simple and economical system to install, and which would give reasonably good results, might be considered as fulfilling the terms of the competition. At the same time the ideas and the method of their working out were considered well worth publication and the objections to the design which have been enumerated are, after all, easy to rectify and involve, at the most, either omissions or minor revisions.

It is particularly desired to compliment Mr. White on the neatness of his drawings and the fine quality of their execution. It is seldom that a set of drawings is encountered that even equal Mr. White's on a basis of delineation.

Group Heating of Industrial Plants

(*Continued from Page 78*)

At pumping station:

Flow-meter reading, 750 H.P.

Steam pressure at pumping station, 130 lbs.
Total temperature, 490° F.
Superheat, 135° F.

At extreme end of line:

Steam pressure, 102 lbs.
Total temperature, 352° F.
Superheat, 23° F.

The work was started November 24, 1926, and was completed, with all plants using steam, February 1. Outside work (all of which was on the lake front) was carried on during the severest of winter weather, not even being stopped by a blizzard.

From the many favorable comments made by the subscribers, after six months' usage of steam as supplied by this system, it is apparent that a great field exists for group heating of industrial plants, thereby eliminating the operation of individual heating plants.

By reference to the accompanying drawing, it is observed that there is a difference in level of 50 ft. between the pumping station and the New York Central tracks. The main line follows this contour. Heavy concrete beam construction was used under each rail of the high-speed tracks. Also the Ric-wiL conduit under the tracks was special cast-iron section, instead of tile. This cast-iron section also was used under the streets, due to heavy trucking thereon. Where the main line enters a factory building, about midway of its length, it rises to the ceiling and drops at the end of the first building, to cross under the freight track, rising again to the ceiling of the second building. Dripping of the line takes place in the manhole at the rise. Underground construction was again used for the end of the line. It is seen that the line is very irregular as regards levels, as every advantage was taken of building construction to lessen the cost of installation.

A brief summary of the advantages of the system would be as follows:

Low first cost of installation, due to use of high-pressure steam with size of steam main designed to accommodate same, instead of low-pressure steam.

Very small line loss on account of superheat in steam. As the line is under the control of the mutual company, operated for no profit of the company, the cost of steam is very low.

Maintenance is being taken care of by the plant superintendent of one of the subscribing companies. This assures always having labor which is employed at other work, using it on maintenance of the steam distributing system when required.

Eliminating the operation of individual plants, making it possible to determine the exact cost of steam for heating.

Extreme flexibility—Steam is always available in sufficient volume and can be controlled in each plant by closing one main valve when heat is not required.

London Theater Faces Heating Problem

A COMBINATION of unfortunate circumstances recently made the Adelphi Theater, London, almost icy cold for the performance of the murder play, "The Big Drum."

The manager of the Adelphi Theater explained that during the performance of this particular play the doors had to be kept open, for the audience actually takes part in the unfolding of the plot. It was a raw cold night, and in consequence waves of cold air swept through the open doors.

The Adelphi is one of the six theaters in the Gaunt-Shubert group, each of which has a modern heating installation. For the most part the Stodd system of heating and ventilating is employed throughout the playhouses of this group. Used air is expelled and warm fresh air is pumped into the building.

As a general rule, the temperature of a London theater in ordinary cold weather is about 62° F., but in very cold spells—very important times in a theatrical manager's life—special care is taken daily to insure an equable temperature. In order to combat the cold from the open doors, it has been found necessary to raise the Adelphi Theater's temperature several degrees during the run of this play.

PIPECRAFT

IN using pipe bends to absorb expansion in heated pipe-lines it is often very difficult to know just how long the spring pieces must be in order to do the work required and, at the same time, not have them longer than absolutely necessary. The mathematics entering into the calculation of the necessary lengths of such spring pieces are more or less complicated and involve a considerable amount of work. This is largely owing to the many factors entering into the problem for any given set of conditions; also to the great number of variables encountered in different installations.

First, there must be determined the kind of bend; whether it is a simple 90° bend or a "U" composed of four 90° bends; also, if there is only one expansion bend to consider or if there are several in the same line.

The next point to receive attention is that of temperature—how much difference will there be between the cold temperature and the hot temperature of the line. Then there is the length of the line to be considered, and whether the pipe is covered or bare. As most steam piping nowadays is covered, it will be assumed in this article that the pipe is amply protected by a suitable and reasonably efficient commercial covering.

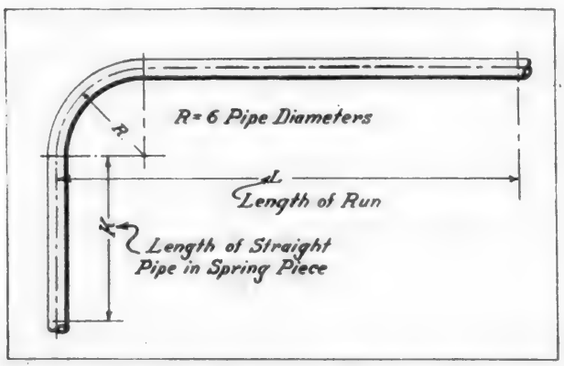


Fig. 81. Simple 90° Type "A" Bend

Several years ago an important engineering and contracting company spent considerable time in developing factors which could be used to determine the length of spring pieces necessary for various conditions, and arrived at results which were used with success for some years. The calculations were involved, and the procedure cannot even be outlined in an article of this length. The results only will be presented here, inasmuch as they have received the test of actual use and have not been found wanting. They will serve, at least, for a check on various installations where doubts may arise as to the correctness of the bends designed.

As a basis this concern first determined the temperature differences to be used and, as their practice involved pressures up to 300 lbs. gauge, this developed a tabulation. It will not be attempted in this article to cover high-pressure work — the extension of the tables here presented to include higher pressures is simply one of computing the greater expansion due to the higher temperatures encountered with the higher pressures. For ordinary heating work it will not be necessary to assume pressures in excess of 5 lbs. gauge as few heating systems operate above this pressure. Where they habitually run at pressures below 5 lbs. gauge it only means that the spring pieces are of sufficient length to take care of the increase in length if 5 lbs. gauge should ever be reached by accident.

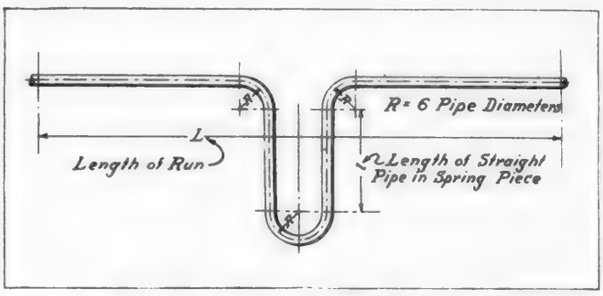


Fig. 82. Loop or Type "B" U-Bend

At 5 lbs. gauge the temperature of saturated steam is nearly 228° F., and if it is assumed that the piping is erected in temperatures which are not below 40° F., then the temperature difference between the hot condition of the pipe and the cold condition will be

228° — 40° or 188° F.

There are three types of expansion bends—or, perhaps, it would be more correct to say that there are three ways in which expansion bends may be installed. The first of these is the simple right-angle bend, as illustrated in Fig. 81; hereafter this will be called the "Type A Bend." The second is the loop, or U-shaped bend, which will be designated as the "Type B Bend" and is shown in Fig. 82. The last consists of several bends installed in the same line, all being Type B Bends but constituting, *in toto*, what may be termed the "Type C Bend" as illustrated in Fig. 83. The distance "L" is the length of pipe for which expansion is to be provided, which

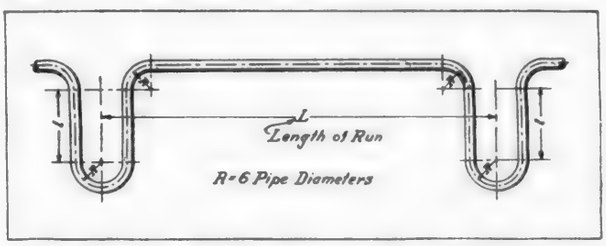


Fig. 83. Double Loop or Type "C" Bend

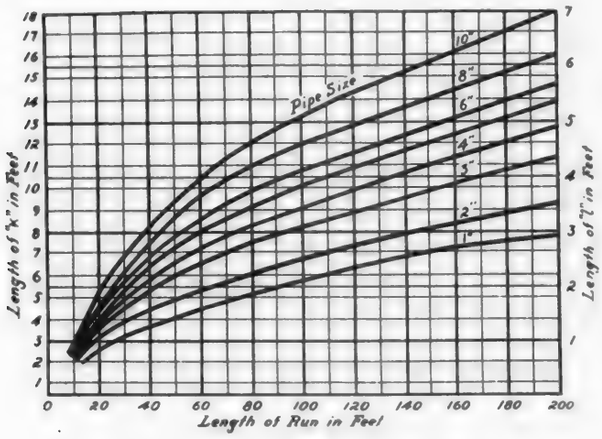


Fig. 84. Curves Showing Lengths of Spring Pieces for All Types of Bends

will be taken as 100 ft., for the purposes of this article, and the distance "l" is the amount of straight pipe required in the U spring piece; as this is much longer in the Type A Bend, the distance "k" will be used for that particular length.

On account of the fact that the larger the pipe size, the stiffer the bend, the length of the spring piece will differ for every size of pipe, even for the same amount of expansion.

Tables for 100 ft. and 50 ft. Runs of Pipe

Having assumed a run of 100 ft. of pipe as a basis, the length "k" for the Type A Bend and the length "l" for the Type B and Type C Bends is as given in Table I.

TABLE I

SIZE OF PIPE IN.	LENGTH OF "K" FT.	IN.	LENGTH OF "L" FT.	IN.
1	5	6	2	3
2	6	8	2	5
3	8	0	3	1
4	9	0	3	5
5	10	0	3	10
6	11	0	4	0
8	11	6	4	6
10	13	0	5	0

Note—Radius of pipe assumed as 6 times the diameter. Length of run = 100 ft.

In order to ascertain the lengths of straight pipe in the spring pieces for other lengths of run it must be remembered that these will NOT be proportional, as the spring of the bends is a fixed quantity and must be allowed for before determining the length of straight pipe. That is to say, the length of straight pipe in the spring piece will not be half as much for a 50-ft. run as it is for a 100-ft. run. This is shown in Table II where the lengths for a 50-ft. run are given.

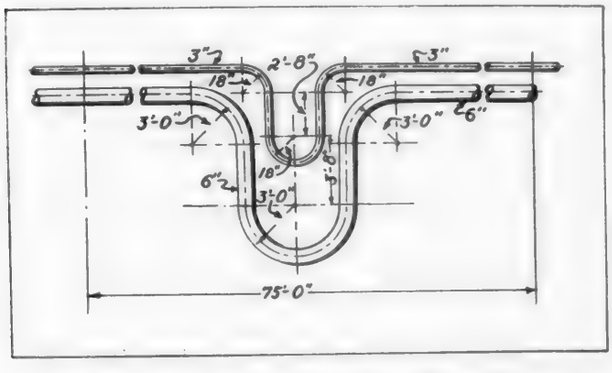


Fig. 85. Loop Bends as Determined from Curves

TABLE II

SIZE OF PIPE IN.	LENGTH OF "K" FT.	IN.	LENGTH OF "L" FT.	IN.
1	4	0	1	5
2	5	0	1	10
3	6	0	2	3
4	6	6	2	5
5	7	3	2	9
6	7	9	2	11
8	8	6	3	3
10	9	3	3	6

Note—Radius of pipe assumed as 6 times the diameter. Length of run = 50 ft.

By taking the lengths of spring pieces—or the amounts of straight pipe included in same — for various lengths of run, it is possible to plot curves

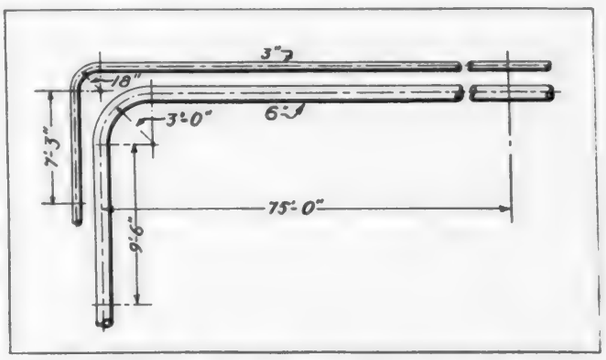


Fig. 86. Right Angle Bends as Determined from Curves

which will hold for any length of run within the range of the curves. This has been done in Fig. 84, where the lengths of run are given along the bottom and the lengths of straight pipe required in the spring pieces for "k" are given in the left-hand side scale, while the lengths of the straight pipe required in the spring pieces "l" are given in the vertical scale on the right. It must be remembered, however, that the lengths *are for temperature rises of* 188° *F. only*, such as are usually encountered in heating work. Higher temperature rises require a suitable lengthening of the spring pieces to accommodate the additional expansion.

In cases where higher temperatures are encountered the curves given can be applied if the actual expansion is figured at the higher temperature and the length of run "L" is then increased to a fictitious length whose expansion at 5 lbs. gauge *would equal the actual expansion encountered in the higher temperatured line.*

As an example of how this method works when actually applied, let two lines be assumed, each having a length of 75 ft., the smaller being 3-in. size

(Continued on Page 87)

This is the twenty-ninth lesson of
The Heating and Ventilating Magazine's

New Home-Study Course in Gravity Steam and Water Heating

Lesson No. 29 (Continued)

Estimating Steam and Water Heating Jobs*

By Ara Marcus Daniels

SETTING costs for radiators should be kept separate from the distribution charge. No card is needed for standard radiation. It is necessary, however, to prepare a card for setting wall or indirect radiators, and in so doing the charges should be available for different walls, such as stud, lath and plaster, or brick. Necessary material should be itemized and its cost shown, together with the time required and cost thereof for the placing of brackets, and hanging the radiator, or such drilling and placement of expansion bolts to which to attach brackets or hangers, as may be required. Then with the basic rate charge for man and helper per hour noted, the card is complete.

By some, it may seem that the conditions under which such radiation is installed are so different that it is impossible to establish a usable cost. Such, however, is not the case. Study of the conditions will permit the preparation of cost data for such work as will assist materially toward eliminating or reducing guesswork to a minimum.

Unless an effort is made from time to time, even though it is not done on all work, which is the proper thing to do, to establish definite costs, a contractor can never be sure as to whether his construction methods and estimates are consistent and whether profits are what they should be.

CUTTING AND THREADING PIPE

One of the most important items in preparing an estimate is the cost of cutting and threading the pipe. While these operations are closely allied, yet the most reliable costs are established by computing each operation separately and charging thereto exactly what it should carry.

Time studies are essential for obtaining correct cost factors for these operations. Contractors may have different ideas as to the establishment of such factors, and so it is not the intention to lay down any hard and fast rules, but rather to suggest means and methods by which apportionments and charges may be handled in a logical and systematic manner.

The cutting charge should carry all the time of men required to take the measurement, place the pipe in the vise, lay off the measurement, make the cut, ream and remove the pipe from the vise. The threading charge should carry the average time required for threading a pipe of the particular size and properly should include all incidental time consumed, such as changing dies, tightening pipe in vise from time to time, cleaning dies, etc.

CUTTING AND THREADING CARDS

A card for establishing the cost of cutting pipe of different sizes should show, at the top, the kind of pipe to which it refers and should contain columns to care for all items involving expense. It should give for each size of pipe, the time in minutes required to make a cut, including all delays incident thereto; the cost of labor per hour in making the cut; the cost of incidentals such as oil used, depreciation on machinery and tools, power purchased for operating a machine, rent of machine, etc., reduced to a minute basis so as to estimate it according to time required for the cut; and the aggregate cost of all items detailed.

A card to show pipe threading cost factors should be prepared similar to that used for pipe cuts. The items will be practically the same, as well as the time-study requirements.

CUTTING WALLS, CEILINGS AND FLOORS

The heating contractor seldom has this item to consider in new or large construction work. Generally it is cared for as a part of the building construction contract. In the case of old buildings, however, the cost of such work usually is borne by the heating contractor, and should not be overlooked in preparing the estimate.

Estimators frequently guess at this item. Experience indicates that difficulties in this work are many. Beams and joists so often seem to be right

*Copyright, 1928, Ara Marcus Daniels.

in the path of a pipe and many times it is necessary to go through a masonry wall.

Considerable effort and many time studies will be required to develop accurate cost figures for such work, but when once properly established and checked, surprisingly satisfactory data will result. The two important things to keep in mind in arriving at costs for such cutting work are (a) material to be cut and (b) size of hole required. Data may be advisable for single wood floors, double wood floors, tile and masonry floors, stud, lath and plaster walls. Besides holes required, the cutting of pockets between beams or joists for making offsets between floor and ceiling should not be overlooked. In this operation every item entering therein should be included, such as boring holes for radiator spuds and replacement of flooring, together with all material needed.

Masonry walls present a more standard problem. Holes will vary from 1½ in. to 6 or 8 in. and walls may be of concrete, brick or stone. Time studies should be made and data gathered to obtain a representative price for each size hole per inch thickness of wall. Patching cost should be established so that from the cost card a price will be available which will show how much it will cost to get the pipe in place and restore to its previous state that part of the structure which was cut.

SLEEVES

The setting of sleeves does not always need to be included in the heating contractor's estimate. Other contractors frequently are required to set sleeves according to blueprint measurements, which relieves the heating estimate of this charge. At other times, the heating contractor must set sleeves for his work as the other work progresses or he must set them in holes or chases cut in completed construction. Under either of these conditions a material and labor charge for setting sleeves must be included by the estimator. Hence, cost cards for this work should be available.

The time charge can best be determined by actual time studies, using a sufficient number of sleeve settings to obtain an average which will represent a safe and proper cost factor for the particular type of sleeve and setting condition. Several cards usually will be required to care for each type of sleeve and condition of setting same. Each card should include the net cost of the sleeve; the actual time, from time studies; the time to allow when preparing an estimate; the labor charge and the total cost with the basic labor charge on an hourly rate for man and helper.

RADIATOR VALVES, UNION ELBOWS, TRAPS AND RADIATOR BUSHINGS

To have accurate data available for estimating the cost of a radiator valve, union elbow or trap in place or for bushing a radiator, time studies must be made and properly recorded on the cost card for the particular piece of equipment. Such time studies are especially useful for large job estimating and should be made for the different sizes of valves, etc. Thus the time and labor cost should be shown for making up bushing, spud and union nut assemblies.

The cost card should define, at the top, the piece of equipment covered, such as radiator valve or union elbow, etc.

For jobs where the number of pieces is few, it is not unusual to take off all make-ups required for setting the valve, union elbow, or trap when piping quantities are taken off, and record same on the work sheet at once, as explained in the latter part of the next lesson in connection with the work sheet illustrated in Fig. HSE-2-1.

For large jobs, when working on piping quantities it is better to list all make-ups as far as the spud into radiator valve, and then take care of the balance as a charge directly against the valves, elbows and traps by using the cost card data as developed from time studies.

A good estimator, however, can be depended upon to handle this item in a manner that best suits his methods.

SMOKE PIPE

Smoke pipes must be built and then erected. In many cases, the heating contractor purchases the smoke pipe, with necessary fittings, all made up, and, under this condition, the estimator has to have available only costs for the different sizes of pipes and fittings. Where the heating contractor makes the smoke pipe, it is necessary for him to have a cost card showing the cost of material and labor required to produce the pipe ready for delivery to the job. In preparing such data, care should be taken to include shop overhead and profit for the manufacturing end, if it is desired to keep the manufacturing and contracting ends of a business separate and distinct from each other.

Cost cards for the manufacturing should show unit length of material required for a given size pipe, its weight and cost, the time needed for manufacture and its cost on a basic rate of pay.

Smoke pipes are erected with slip joints or with riveted joints. Obviously, a riveted joint is more costly than a slip joint. Hence, the estimator should have available a cost card showing costs for different sized smoke pipes for riveted or slip joint work. These data should be reduced to a figure to indicate cost per joint for erection which should include the joining of lengths, any necessary cutting, placing and staying the pipe. Where elbows are required, an estimate of the cost of time for adjusting them should be inserted and preferably should be based on data obtained from actual time studies, including the cost of elbows necessary.

DAMPERS

The type of damper to be installed and the thickness of the metal of the pipe in which the damper is to be set affect the cost. A cost card for this

ESTIMATE SHEET

JOB NO. _____

OWNER _____

LOCATION _____

PREPARED BY _____ DATE _____. CHECKED BY _____ DATE _____.

½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6	SIZE	PIPE TOTALS FT.	PIPE TOTALS UNIT COST	PIPE TOTALS TOTAL COST	PIPE CUTS-TOTALS No.	PIPE CUTS-TOTALS TIME HRS.	PIPE CUTS-TOTALS COST	PIPE THREADS-TOTALS No.	PIPE THREADS-TOTALS TIME HOURS	PIPE THREADS-TOTALS COST
													½									
													¾									
													1									
													1¼									
													1½									
													2									
													2½									
													3									
													3½									
													4									
													4½									
													5									
													6									

SIZE	PIPE CUTS	PIPE THREADS	SIZE	MAKE-UPS SIMPLE	MAKE-UPS DIFFICULT	MAKE-UPS AVERAGE	SIMPLE No.	SIMPLE HRS	SIMPLE COST	DIFFICULT No.	DIFFICULT HRS	DIFFICULT COST	AVERAGE No.	AVERAGE HRS	AVERAGE COST
½			½												
¾			¾												
1			1												
1¼			1¼												
1½			1½												
2			2												
2½			2½												
3			3												
3½			3½												
4			4												
4½			4½												
5			5												
6			6												

SIZE	ELBOWS 90°	ELBOWS 45°	STRAIGHT TEES	NIPPLES CLOSE	NIPPLES 2"	NIPPLES 3"	NIPPLES 4"	NIPPLES 5"	NIPPLES 6"
½									
¾									
1									
1¼									
1½									
2									
2½									
3									
3½									
4									
4½									
5									
6									

SIZE	PLUGS	SCREW UNIONS	FLANGE U.	PIPE HANG.	BUSHINGS	REDUCING TEES
½						× × × × ×
¾						× × × × ×
1						× × × × ×
1¼						× × × × ×
1½						× × × × ×
2						× × × × ×
2½						× × × × ×
3						× × × × ×
3½						× × × × ×
4						× × × × ×
4½						× × × × ×
5						× × × × ×
6						× × × × ×

SIZE	RAD. VALVES	RAD. TRAPS	UNION ELLS	OTHER VALVES SIZE	OTHER VALVES KIND	OTHER VALVES NUMBER	OTHER ITEMS
½							
¾							
1							
1¼							
1½							
2							

Fig. H S E-2-1. Typical Work Sheet

item should include a cost for the damper, the labor, time, and charge as averaged from a number of settings, and a total cost. It is customary to establish a damper cost card for light metal work, up to 18-gauge metal, and for heavy gauge work, above 18 gauge.

BOILER AND FITTING INSULATIONS

Plastic asbestos cement is largely used for insulating boilers and fittings and will be considered here as the substance in mind.

Two units for estimating costs of doing this work are available; (a) per square foot of a given thickness, (b) per pound of cement used. The unit by area may be used where surfaces are relatively large, such as a boiler, but is cumbersome in the case of valves or fittings. The cost of covering a boiler of given make and size with 1-in., 2-in. or other thickness of insulation is quite easily and accurately established. Every good estimator usually has this cost established for all boilers which are likely to be used, so that his cost card on this item gives a factor for the entire boiler and includes both the cost of the cement and of the labor to apply it.

The cost of applying plastic cement to fittings is best established by determining the net weight of cement and time required for applying it to a known number of fittings, and then estimate the cost for each different fitting on the basis of the respective area, for a given thickness of cement. Thus, very definite costs for different sizes and kinds of fittings can be set down on the cost card for such work.

PIPE INSULATION

Pipes generally are insulated with a sectional pipe covering. Two operations are required in applying this; (a) placing the covering; (b) pasting or sewing on the canvas jacket. Then the work may be done under favorable or unfavorable conditions. The cost card, therefore, should include for different sizes of pipe, as separate items, net cost per foot for the covering and for the jacket, and the time required and cost thereof to place it and apply the jacket.

Properly, such labor costs are determined by keeping accurate time charges on a number of jobs under different conditions for various lengths of the same sized pipes, and averaging to obtain a cost factor per foot of pipe covered, which, used as a standard and modified for favorable or unfavorable working conditions, will supply accurate data. Figures thus used should be checked from time to time against actual construction costs.

BRONZING AND PAINTING

Bronzing or painting costs must be established for the type or kind of surface to be covered and the method employed in so doing. In estimating costs for bronzing or painting pipe, a factor per square foot of surface may be used. Where column radiation is to be done, the style of radiation must be considered, since 100 sq. ft. of single column radiation presents considerably more surface to be bronzed or painted than a 3, 4, 5 or 7 column radiator of equal radiating surface. Thus, material and labor costs must be established for different kinds of radiators. In doing so, a satisfactory basis is to use 100 sq. ft. of heating surface for the type of radiation being considered and disregard the actual surface to be covered.

Thus, a cost card on radiator bronzing or painting might be prepared on a 3-column radiator on the basis of one coat per 100 sq. ft. of heating surface and should provide columns for amount and cost of bronze or paint and liquid or oil and for the required time, cost of same and total cost of the work. Data will have to be developed from actual time study and material requirements. The figure used should be checked from time to time and changed, as necessary.

A cost card for bronzing or painting pipe may be based on a unit of 100 lineal feet for the different sizes of pipe and should include similar items of material and labor costs as for radiators.

The next and last lesson, to appear next month, will contain a further consideration of cost cards, typical estimate sheets and their use.

Pipecraft

(*Continued from Page* 83)

and the larger 6-in. What would be the dimensions of a U-Bend located in the middle of the line, with each end fixed, so arranged as to take up all the expansion produced when the lines are heated up to the temperature occurring with 5 lb. gauge pressure steam? In the case of the 3-in. size the radius of the bends would be 6 times the diameter of the pipe or

$$6 \times 3 = 18 \text{ in.}$$

while in the 6-in. size it would be

$$6 \times 6 = 36 \text{ in.}$$

Reference to the curves shown in Fig. 84 indicates that the length "l" would be about 2 ft. 8 in. for the 3-in. pipe and about 3 ft. 8 in. for the 6-in. pipe. This will give a loop dimensioned as shown in Fig. 85.

Similarly, if the same two pipes, instead of having been run straight with the loop in the middle, are offset with a 90° turn, how long a leg "k" would be required beyond the bend before the pipes could be anchored or fixed in position? Referring again to the curves, and reading off of the other scale which covers the length "k" it is found that for the 3-in. size the length must be not less than 7 ft. 3 in., while for the 6-in. pipe it must be not less than 9 ft. 6 in. These two bends and spring pieces are illustrated in Fig. 86.

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THERE was a time when "British thermal unit" had a strange sound to heating men. It is only within recent years, comparatively speaking, that it generally has been accepted, at least in American engineering circles. The same thing may be said of other expressions such as "vapor heating," "air conditioning" and "effective temperature," now so familiar as to be part and parcel of the technical language of the industry. Early in 1922, the American Gas Association sponsored another term, now widely used in the gas-heating industry. This, the "degree-day," represents the product of one degree of temperature and a time factor of one day.

Until now we have said that the heating season is so many hours long, 5000, more or less, and that the average outdoor temperature is, say, 30° F. in a given section of the country. With such data we have tried to determine how much heat must be supplied, through the medium of steam, hot water or warm air, to meet the requirements. However, on that basis, there is no practical way of determining whether or not our calculations have been accurate. On the other hand, note the accuracy of the degree-day method. We take the average outdoor temperature for any period — a day, week, month or year—subtract it from 65° F., an arbitrary figure set up as the point above which no further heating is required. The remainder, when multiplied by the number of days under consideration, represents the degree-days for that period. Take, for instance, the month of January in New York City. The average temperature for that month, based on observations covering 50 years, is 30.9° F. Subtracting this figure from 65° F. leaves 34.1°. Multiplying 34.1 by 31 (the number of days in the month) we arrive at the figure of 1077 degree-days. This, then, represents the heating load in January in New York City and always will, with slight variations. The degree-days for the other months of the heating season can be computed the same way, and the total degree-days is the actual heating load for the season and not an approximation. It is easy to translate these totals into tons of coal, gallons of oil or cubic feet of gas.

To mention but a few of the advantages of the degree-day method, for one thing we can compare the heating requirements at any given place, during one heating season with those of any other heating season. What is more, we can draw a series of lines across the country so that each line will cross the points which require the same amount of heat. This, by the way, has been done in the iso-fuel-consumption charts published by THE HEATING AND VENTILATING MAGAZINE.

ONE of the beauties of the degree-day method is that it applies to any fuel. The fact that the unit originated with the American Gas Association by no means confines its use to the gas industry, although, if one should judge from practically all of the articles which have appeared in other journals, its use would seem to be limited strictly to the gas field. Even in the 1928 edition of the A.S.H. & V.E. *Guide* we find the degree-day carefully expounded in the section on gas heating, but mentioned nowhere else.

Like every other good thing out of the ordinary, it takes time to edge its way into the confidence of those who can make the best use of it. We are naturally conservative and thus are slow to change our accustomed ways. But in this instance, the merits of the degree-day as a measure of the heating load, and of the iso-degree-day curves for comparative purposes, are so obvious, and their application have been found to be so accurate, that nothing but benefit can result from their general adoption. The National District Heating Association already has expressed itself in convention as favorable to the degree-day method. Is it not time for the American Society of Heating and Ventilating Engineers, the Heating and Piping Contractors National Association, the American Oil Burner Association and the National Warm-Air Heating and Ventilating Association to give their endorsement, and in that way add the term of degree-day to the accepted technical nomenclature of heating and ventilation?

Is Boiler Rating an Engineering or a Trade Problem?

AN analysis of the boiler-rating code problem by Robinson V. Frost, well-known consulting engineer, approaches the subject from a new point and suggests that, after all, the matter is an industrial rather than an engineering one. Mr. Frost says:

"There is an angle to the question of boiler ratings, long disregarded, that now bids fair to be recognized as the controlling factor. That it may be more widely considered, it is here presented in this open discussion on the subject.

"The controversy is fundamentally one between the producer and consumer; the producer represented by the manufacturer and the consumer by the contractor. The contractor demands a standard upon which he can make a true comparison of values while the manufacturer quite naturally, impelled by the trader's instinct, demands as much for his product as can be obtained. He is guided by the law of supply and demand and fixes his price accordingly. If the contractor refuses to buy a manufacturer's boiler because he cannot get as low a price per square foot of radiation as he can from another, then the manufacturer must increase the rating of his boiler to induce more sales.

"The problem is more properly a trade problem than an engineering one and the engineer is concerned largely because of its trade aspect.

"The criticisms of the code, as at present proposed, seem to come equally from both sides and are directed almost without exception at the flue-gas temperature limitation. The critics are virtually in agreement that 700° is too low a limit and have indicated generally that the limit more properly could be between 800° and 900°.

"The purpose of a temperature limit in the mind of the committee is said to be twofold. First, to prevent waste of fuel, and second, for fire prevention. The first is of as great concern to the manufacturer as to the consumer, for sales now are quite dependent upon an economically operating boiler, but the second has never been a matter of much concern in the steam and hot-water field, for flue temperatures always have been relatively low as compared with warm-air furnaces and stoves.

"The present trend in boiler design is toward higher stack temperatures and with the increase in temperature has also come an increased efficiency, so that there are now several boilers on the market having stack temperatures of 800° at efficiencies of 70% and more.

"To the manufacturer and designer, stack temperature has been more or less a secondary factor, while *firing period*, *draft*, and *economy of fuel* have been the controlling features. These are the factors that have entered into the sale and these are the factors that have guided the fixing of rating.

"After all, the question of rating has been of more serious concern to the manufacturer than to anyone else and the reason for the delay on his part in bringing about a settlement has been because of the great mass of conflicting factors that first needed to be cleared away, rather than to a lack of desire to settle upon a basis. The consumer must share an equal responsibility in the delay, for until recently there was exhibited a woeful lack of intelligent appreciation of the factors involved in boiler rating. If inflated ratings played a part in arousing a live concern in the subject then they were of more value than we are inclined to credit them. With the more intelligent interest displayed there has been voiced an insistent demand for more complete data on boiler performance and the manufacturer has been quick to supply the demand.

"A form in which these data have been presented by a prominent manufacturer is illustrated. A similar and more comprehensive tabulation was shown in THE HEATING AND VENTILATING MAGAZINE for September, 1927, on page 93. These are convincing evidence of the desire of manufacturers to supply the trade with workable data for intelligent boiler selection. The contractor has in these data all that is required to enable him to make a thorough comparison between boilers of different makes so that, with complete assurance, he can pick the boiler best suited for a

BOILER PERFORMANCE TABLE

Grate Area—11.94 sq. ft. Depth Fuel—16 ins. Tot. Fuel Cap.—836 lbs. Available Fuel Cap.—627 lbs.

1	Firing Period—Hours to burn one Available Fuel Charge	4	6	8	10	12
2	Fuel burned per hour—Lbs.	156.7	104.3	78.3	62.7	52.2
3	Rate of Combustion—Lbs. of Fuel burned per sq. ft. of Grate per hour	13.12	8.75	6.56	5.25	4.37
4	Efficiency of Boiler—Percent	64.	69.3	71.5	72.	71.5
5	Evaporation per lb. of Fuel @ 12,500 B. T. U. per lb. Fuel; Steam @ 2 lbs. press.	8.28	8.97	9.25	9.32	9.25
6	Output at Boiler Outlet—Lbs. steam per hour	1300	937	726	585	483
7	Output at Boiler Outlet—B. T. U. per lb. of Fuel	8000	8670	8940	9000	8940
8	Output at Boiler Outlet—Thousands B. T. U. per charge of Avail. Fuel	5020	5430	5600	5630	5600
9	Output at Boiler Outlet—Thousands B. T. U. generated per hour	1255	905	700	563	466
10	Output at Boiler Outlet—Sq. ft. Direct Cast Iron Column Steam Radiation @ 240 B.T.U. per sq. ft. per hr.	5220	3770	2920	2355	1940
11	Net output, with 25% allowance for piping—Sq. ft. Direct Steam Cast Iron Column Radiation @ 80% of 240 B. T. U. per sq. ft. per hour	4170	3015	2335	1883	1550
12	Net output with 25% allowance for piping—Sq. ft. Direct Water Cast Iron Column Radiation @ 80% of 150 B. T. U. per sq. ft. per hour	6680	4820	3720	3015	2480
13	Flue Gas Temperature leaving Boiler Degrees Fahr.	540	510	460	420	380
14	Average Draft Tension at Smoke Outlet of Boiler Inches of Water	.14	.12	.06	.03	.02
15	Average Draft Tension over Fire Inches of Water	.04	.02	.01	.005	.005
16	Required Chimney Draft at Smoke Outlet at Specified Temperature Inches of Water	.20	.18	.10	.10	.10
17	Chimney { Dimensions ins. / Height ft.	16x20 / 55	16x16 / 50	16x16 / 45	12x16 / 45	12x12 / 45

Ratings based on the use of Anthracite Coal, stove size or larger, moisture free, 12,500 B. T. U. Heat Value, 10% Ash.
Total Fuel Capacity, @ 52.5 lbs. per cu. ft. Coal, to center of Fire Door.
Available Fuel Capacity, 75% of Total.

Is a Boiler Rating Necessary if Manufacturers Furnish Such a Table of Performance as This?

specific installation. Having these data and the manufacturer's price, what more can be required in the way of a rating?

"This in the opinion of many is a step far in advance of the proposed Code for Rating and though the code may be adopted, this more advanced plan likely will become widely employed by the manufacturers and receive the heartier approval of the contractors than would a code developed along the lines proposed."

Large Buildings Attract Gas Companies

THE application of gas heating to large buildings, such as hotels, office and apartment buildings and auditoria presents no extraordinary difficulties, according to the report of a sub-committee of the House Heating Committee, A. A. Pihlman, chairman.

In heating such buildings as the main offices of the Boston Consolidated Gas Company and the Westchester Lighting Company, both of which have been described in recent issues of THE HEATING AND VENTILATING MAGAZINE, as many as six boilers have been installed, each rated at about 40,000 sq. ft. of steam radiation. This is the largest unit now available for gas heating, but, as Mr. Pihlman points out, cast-iron heating boilers already have been used for plants serving 87,000 sq. ft. of steam radiation, so the limiting size is not yet in sight.

From this comprehensive report the following high lights are quoted:

"In considering house heating the difference between the operating cost of a coal-fired plant and a gas-fired plant is charged to the customer's desire for better heating, elimination of coal and ash problems and the personal satisfaction which accrues to him because of the remarkable improvement in the cleanliness of the basement.

"For apartment houses, hotels, office buildings, and all except the owner-residences, there is not this appeal to the owner's personal interest in the elimination of dust and dirt except where the difference is manifested by the over-all operating cost sheet. In these cases those advantages of gas equipment to which intrinsic values may be attached must be pointed out and possibly suggestions made for their development.

SPACE SAVING AN IMPORTANT FACTOR

"Space saving in a 25,000-sq. ft. steam job amounts to about 1200 sq. ft. over coal-fired equipment. This would make room for a generous sized tailor shop or shoe repair shop. Such stores are provided at present even where coal-fired equipment is used, but if the extra space is not needed then the excavation will be less by the volume saved if gas equipment is selected.

"The city steam service companies have already made great progress in displacing boiler room equipment for the more profitable exploitation of the space so released. Labor saving also becomes a very appreciable credit to the gas-fired job. In general, although we have the same variety and quality of heating service for large buildings as had been sold to residence customers we must fit it to a more exact financial balance.

"In line with the development of the space-saving feature of gas equipment, the installation of gas boilers in pent houses on the roofs of buildings was investigated.

GAS BOILERS CAN BE PUT ON ROOFS

"It is entirely feasible to have the boilers situated on the top of a building and have radiators fed from down-feed risers with condensation collected in a receiver at the bottom, the condensation being lifted from there in a single stage to a receiver near the boiler from which it can be pumped into the boiler. The utility of the down-feed riser has been demonstrated by a number of large installations and as for lifting condensation there are available at present condensation return pumps which can accommodate any existing combination of boiler capacity and height of building, for instance, a pump with a capacity of 25 gals. per minute or sufficient to serve 50,000 sq. ft. of radiation can be supplied to deliver against 195 lbs. per square inch or 450 ft. of head.

"As for the construction required to support the boiler room load, it should be noted that the floor load under the actual boiler setting of the largest gas-fired cast-iron boiler made at present is 415 lbs. per square foot and averaged over a boiler room to accommodate capacities of the order of 50,000 sq. ft. will average about 125 lbs. per square foot with a minimum of clearance space. The space occupied in this manner will approximately equal the actual coal-fired boiler area required by such a building. This does not present a serious problem in construction as at present greater loads are carried for other equipment on the roofs of large buildings. A great advantage of such an installation is the elimination of flue troubles. A short and ample flue can easily be provided.

"It is recommended that weather strippings and insulation of large buildings be promoted because savings amounting to one-third of the total heat loss from the building without such construction can be effected. While these savings apply equally well to other fuels, yet we have an opportunity at present to associate with gas heating equipment the idea of heat loss reduction by insulation and weather stripping, just as oil fuel is associated with the idea of automatic heat. That, combined with the gradual but steady increase in the cost of burning other fuels, makes gas fuel seriously competitive for larger building heating plants."

The Eighth Wonder

Under this apt title, the B. F. Sturtevant Co., Boston, Mass., has had printed by the University Press, Cambridge, a cloth-bound volume commemorating the completion of the Holland Tunnel and characterizing it as a logical addition to "The Seven Wonders of the World," as named by Antipater in the second century B. C. Typographically, and as an example of the bookmaker's art, this volume would not be out of place on any library table. The material, used to formulate a running story, in admirable style, of the conception and the building of the Holland Tunnel, came from many sources and is acknowledged in a foreword. The many full-page illustrations, on plate paper, form an excellent complement to the text.

Engineers' Licenses in New York State

IN a letter received by THE HEATING AND VENTILATING MAGAZINE from Attorney General Albert Ottinger, of New York State, dated December 19, he states:

"Pursuant to advice from the Education Department of the State of New York, this office is about to proceed against all engineers who are not duly licensed to practice or who have failed to renew their certificates as provided by Article 55 of the Education Law.

"I have to-day written to the various engineering societies of the State and am sending herewith a copy of my letter to them which states further our position in the matter. I should be very glad to have you publish this letter or any part of it that you may deem necessary to convey to your subscribers the necessity of complying with the law in the event that they have not already done so."

In his letter to the Engineering Societies, Mr. Ottinger makes the comment that "up to now it was considered expedient to refrain from pushing this matter, thereby giving the engineers of the State ample time to become familiar with the law and its requirements and to comply therewith. Several years have elapsed since the passage of this act, and this office has been requested to proceed against all delinquents.

"I am writing you concerning this matter in order that you may check up your enrollment and bring it to the attention of any of your members who may be delinquent.

"Will you kindly advise me of your co-operation in this matter."

The Impasse in the School Ventilation Situation

With Data Showing How Misleading May Be Statistics on School Attendance as a Criterion of Good Air Conditions

By Dr. Peter H. Bryce, M. A.

I HAVE read with care and much interest the reports of the Rochester Committee of the American Society of Heating and Ventilating Engineers of February, 1927, and that of the Committee on Heating and Ventilation of the Engineering Section of the American Public Health Association of October 18, 1927, and have tried to understand the situation, which led H. S. West, superintendent of the Rochester schools to write to Mr. Greenman, June 28, 1927, that "this whole thing (the ventilation discussion) comes at a time when our only sound course is to stand still."

In view of the conferences and discussions which have been held, and of the resolutions adopted during the past two years, it seems proper to review the outstanding phases of the discussion.

Briefly summed up, the situation is that it was the view of a majority of the Central Conference at the January 12, 1927, meeting, that the several years' experiments carried on at the A.S.H. & V.E. Research Laboratory, in Pittsburgh, since 1924, are too academic and theoretical to be utilized as a basis for evaluating different systems of school ventilation, and that it is more practical and worth while to take the actual school attendance records as the measure of any method of ventilation.

It then may be laid down as a postulate that in any series of experiments, whether at Rochester or at Syracuse, we have a right to demand that whatever methods of ventilation are adopted, they shall insure air conditions in schoolrooms in consonance with data secured in years of experimental work, to the greatest extent practicable, as measured by sensations of comfort and continued well-being, both of pupils and teachers.

In other words, it would seem to have been contended that a resolution may be esteemed to have more practical value than the results of many actual experiments, for we have in the resolution the following: "Resolved that the questions which have been raised in regard to various methods of school ventilation can best be settled by studies of the actual results, methods and conditions obtaining in schools ventilated by different procedures and operated under different conditions."

In effect we are asked therein to abandon the scientific and generally-accepted *experimental* method, by which, through *inductive* reasoning, ventilating fans, ducts, humidifiers and other apparatus are constructed. Engineers calculated the strength of trusses and piers for the Quebec bridge from laboratory experiments and the late B. Holland, with the assistance of the laboratory, devised successful methods for ventilating his tunnels under the Hudson River. Obviously, such methods are more scientific than those based on deductive logic, long since abandoned to the schoolmen of the Middle Ages.

FACTORS, OTHER THAN VENTILATION, AFFECTING SCHOOL ATTENDANCE

It seems only necessary to examine the general conditions in connection with school attendance to realize how crude and unsatisfactory any conclusions, based upon illness among students, must be. I have had the good fortune, through the courtesy of Mr. Duffield, secretary of the New York Commission on Ventilation, to examine the statistics of the several experiments in the Syracuse schools and have noted that there, as elsewhere, quite apart from actual variations in the ventilating methods of the several test schools, the classes of children vary from one school of Italian children to others of various social classes of the average American children. In this connection I remember the remark of a lady interested in a kindergarten for recent immigrants in Winnipeg, started some years ago. The teacher had told the lady that an English immigrant one day had said to her: "How is it that these foreign children progress so much faster than my children?" To which came the answer: "Because they seldom miss coming to their classes."

STATISTICS FROM THREE CANADIAN SCHOOLS

In order to determine the influence of other factors affecting attendance, I have obtained from the principals of three different schools in the village suburbs of Rockliffe Park, adjoining Ottawa, where I reside, the following statistics of the attendance during the past year. The types of schools are quite distinct and most interesting. The village is one of 1000 residents, in 400 acres adjoining the city. It is purely residential and is supplied with city water and electricity, with much park land and ideal health conditions.

First, there is a select girls' school of some 80 pupils, of whom one-third are boarders, and the remainder are children brought mostly from the city in automobiles. It includes girls from 8 to 16 years of age. The hours are from 9 A.M. to 2 P.M., with a recess and lunch period. In charge of the school is an English lady and a house-mother, with a trained staff. Naturally, its fees are high and its pupils come largely from the best social class, as measured by wealth. The average attendance for a year was 93%.

The second school is the public school of village children, almost all from well-to-do families who believe the mingling of classes and sexes is best for the future Canadian. However, there are children from two or three poor families, whose older girls may have had to be absent for weeks on account of sickness in the home, thereby reducing the average attendance. The attendance of 80 pupils, averaged for ten months, was 89.6%.

The third school is a residential boys' school of 130 pupils, made up about equally of boarders and city day scholars from Ottawa and the village. From September to June, inclusive, the average absences were three per day, or less than 3%, with no separate statistics supplied for boarders and day scholars. The school has an English clergyman as principal and is managed with great strictness and competence.

All three schools have acres of playground and recently have constructed buildings with direct steam radiators in the rooms, but with no systems of ventilation other than double windows in which the inner may be opened while a movable pane of glass in the outer sash admits fresh air in mild weather. At recess the inner windows are opened and the rooms flushed with fresh air.

During the past year the public school had an outbreak of measles, which was especially severe in one classroom, reducing the attendance for a time to two or three daily. The boys' residential school also had 15 cases of measles, with an average absence of three weeks, while the girls' school escaped the outbreak.

It may be taken for granted that all three schools are admirably conducted and every precaution taken to insure attendance. The public school has the

usual forenoon classes, with a recess and dinner hour, and afternoon classes till 4 P.M. Conditions of heating and ventilation probably are equal in all, while the air-space averages at least 400 cu. ft. per pupil. The principal of the boys' residential school, however, is convinced that the dry, still air of the classrooms seriously affects the pupils' efficiency and he is having installed a humidifier to supply, at the same time, moisture and fresh air in movement.

We find, however, that under conditions so favorable as those indicated, the school attendance varied from 89.6% to 93.0% and to 97.7%, or a range of 8.1%.

From this illustration it would seem evident that no correct estimate of the quality of any system of ventilation can be determined from any mere schedule of school attendance and, further, that to depend upon statements by mothers and the imperfect information supplied to district nurses and teachers, with regard to the causes of absence, is to introduce factors into the problem that make exact conclusions impossible.

IMPORTANCE OF MAKING COMPARATIVE TESTS OF OPEN-WINDOW AND MECHANICAL SYSTEMS

Nevertheless, the problem is so important in its wider national bearings that some solution must be arrived at in the larger interests of public health, and it is fortunate that both the Rochester and Syracuse school boards are prepared to co-operate with any committee which will devise a practical and comprehensive series of experiments.

The situation in itself does seem simple enough. The local committees in either or both cities doubtless are prepared to co-operate in the experiment by selecting their own engineer to arrange with two engineers, one representing the New York Commission on Ventilation, and one the American Society of Heating and Ventilating Engineers, to install at least two complete systems of ventilation: one being the so-called open-window system and the other a mechanical system, each to be constructed according to the plans of their respective engineers, under the supervision of the school committees' engineer. Preferably this would be in new buildings, designed for the purpose; though there is no reason why existing buildings could not be rearranged for the purpose.

Of course, it would be necessary (a) to locate the schools in areas where the pupils would be, as nearly as possible, of the same race, age and social status, and that corrections be made for accidents, such as outbreaks of measles, mumps, scarlet fever, diphtheria, and so on; (b) to obtain average results, the experiment should be continued over a period of at least three years, and the investigation be under the complete control of the engineer of the school board, who could select, supervise and control and, where necessary, dismiss the school caretaker or others engaged in the investigation.

In this way, an experiment worth while could be carried out, approaching the accuracy of a scientific test. The several committees have expressed themselves as having no preconceived prejudices in favor of any particular method, and as being anxious only to secure the maximum benefits in the interest of public health. Perhaps these suggestions from an interested onlooker may not be wholly without value.

Radiator Performance Tests at University of Illinois

Bulletin No. 169, issued by the Engineering Experiment Station, University of Illinois, entitled "Effect of Enclosures on Direct Steam Radiator Performance" brings to a conclusion the preliminary report made at the A.S.H. & V.E. midsummer convention at White Sulphur Springs, as presented in THE HEATING AND VENTILATING MAGAZINE for July, 1927. This bulletin is a summary of the results of the first year's work under the terms of a co-operative agreement between the National Boiler and Radiator Manufacturers Association, the Illinois Master Plumbers Association and the University of Illinois, providing for an investigation of steam and hot-water systems.

The immediate object of the series of tests reported in this bulletin was to determine the effect of various types of present-day commercial radiator enclosures, shields and covers on the steam-condensing capacity of a direct cast-iron radiator. The investigation was carried on under the personal supervision of A. C. Willard, head of the Department of Mechanical Engineering, and A. P. Kratz, research professor of the Department of Mechanical Engineering.

As a result of this study, the following conclusions were drawn:

(1) The one-pipe connection to the radiator, in which the steam enters and the condensate leaves through the same connection, gives very consistent and satisfactory results when used for the determination of the steam condensing capacity of radiators.

(2) The coefficient of heat transmission K, or the heat transmitted per square foot of radiation per degree temperature difference per hour, may be corrected to terms of a temperature range deviating (within reasonable limits) from the standard range of 145° F., either by the 0.2% rule proposed by Charles A. Fuller or by the exponential rule proposed by Doctor Dietz.

(3) The type of air outlet used materially affects the performance of a radiator enclosure, and a front outlet, even with a comparatively large area, is less advantageous than a top outlet.

(4) The capacity of an enclosed radiator is appreciably increased by increasing the height of the enclosure, but, for a given radiator, an increase in height with low enclosures results in a greater gain in steam condensing capacity than a corresponding increase in height with high enclosures.

(5) By using the proper combination of inlets and outlets and increasing the height of the enclosure a sufficient amount, it is possible to increase the steam condensing capacity of the enclosed radiator above that of the unenclosed radiator.

(6) Disadvantageous outlets have less effect when used with high enclosures than when used with lower ones.

(7) The frictional resistance in the air inlet is an important factor in the design of an enclosure, and long narrow inlets having large ratios of perimeter to area are undesirable.

(8) Enclosures which were very close approximations of common commercial types reduced the relative capacity of the radiator approximately 15%.

(9) The common commercial shield tested reduced the relative capacity of the radiator about 8%.

(10) The cloth cover tested reduced the relative capacity about 12%.

American Edition of Rietschel-Brabbee's Heating and Ventilation

American engineers will be greatly interested in the first American edition to be published of the well-known seventh German edition of Heizungs und Luftungstechnik by Dr. H. Rietschel, late professor of the Technical University of Berlin — Charlottenburg, and Charles W. Brabbée, now director of the Brabbée Laboratory of the American Radiator Company. Many portions of the German text which do not apply to American practice have been abridged, while others adaptable to conditions in the United States have been emphasized for the convenience of American engineers. The translation was made by Alphonse A. Adler, consulting engineer, of New York.

Part 1 considers in detail various methods of heating, while Part 2 goes at length into the theoretical side of ventilation, including means of insuring air changes and cooling of rooms. Parts 3 and 4 are devoted to heating and ventilation system design and construction, with particular reference to heat transmission, computation of heating surface, piping equations, design of various types of heating systems, determination of required air changes, formulas for the design of details of ventilating systems, cooling and drying air and chimney computation.

Seven separately-printed tables are included dealing with gravity water heating systems, forced water heating systems, high-pressure steam heating systems, vacuum steam heating systems, low-pressure steam heating systems, air heating and ventilation systems and equivalent diameters.

A review of this book will appear in a later issue. Size 6-in. x 9-in. Pp. 352. 186 illus. Published by McGraw Hill Book Co., Inc., 370 Seventh Ave., or may be had through the book department of THE HEATING AND VENTILATING MAGAZINE. Cloth, $4.50.

Welded Steam Piping in Cathedral of St. John the Divine

SINCE 1892 there has been under construction on Morningside Heights in New York City a magnificent structure that will eventually be the third largest cathedral in the world. Work has progressed carefully and deliberately with complete disregard of the hustle and bustle of the great city around and below it. Cathedrals are not built in a day, nor are they built *for* a day. Eternal permanence must be considered at every point in their design.

Piping for Snow Melting Emerging From Walls at Roof Level

At the present time, the immense nave is taking shape and the foundations for the west front have been placed. In developing the designs for the nave and west front, provision was made for concealed radiators high up in the interior of the nave and for snow melters on each of the many sections of the intricate roof. The question of how to run the necessary pipes to these radiators and snow melters was a serious one, for the large number of pipes required would completely spoil the interior appearance of the nave if they were exposed to view.

With characteristic originality and daring, the architects proposed to place these pipes in the center of the solid masonry walls. They were not to run in a pipe conduit but were to be set right in the masonry. This meant that in some places the pipes would be encased in walls 12 ft. thick. Once the piping was installed, there must be no occasion ever to repair it, for repair would mean tearing down part of the cathedral.

Recognizing the necessity for absolutely permanent leakproof joints, the architects specified that all joints on these steam lines should be oxy-acetylene welded. The pipe being used in quadruple extra-heavy wrought-iron pipe, ranging in size from 1½-in. to 4-in., the 4-in. pipe having a wall nearly 1 in. thick. This unusual thickness was deemed necessary in view of the extraordinarily long life demanded of such a structure and the utter impossibility of ever replacing the pipe.

Of necessity, the welders worked just in advance of the masons. Pipe was received with the ends beveled at the mill. After making any bends required, the lengths were placed in position and welded. As soon as welding was completed the pipe was coated with tar and then covered with a heavy layer of insulating material. Stonemasons then went to work and in a short time that section was sealed up for all time. In this way the piping was carried up with the walls. Some of the pipes were brought out to supply the concealed radiators high up in the nave, but the majority extend right up to the roof. When the roof is completed each section will have its own system of snow melters consisting of a perforated pipe

(left) Piping in Conduit in the Foundation of the West Front.

(right) Close-Up of the Welds in Extremely Heavy Pipe

Welding at Foundation Level

welded to the steam lines at the roof level. These will prevent the accumulation of ice and snow on the roof.

Section by section the various lines were tested as completed by capping the ends and applying a hydrostatic pressure of 2000 lbs. per square inch.

Because of the large amount of piping involved, this work has been a welding operation of unusual magnitude. In a way it is unfortunate that not one in a hundred thousand of the visitors to the cathedral will ever know of its existence. Some may wonder at the absence of exposed piping, but few, if any, will guess the romantic reality that lies hidden in those solid walls.—*Oxy-Acetylene Tips for November*, 1927.

American Copper Producers Form an Institute

More than a score of important copper producing companies in the United States are participants in the Copper Institute organized last month to promote closer collaboration and to advance the interests of the industry. The institute will function, in a general way, as do the American Petroleum Institute, the American Iron and Steel Institute and such organizations, and will cooperate with the Copper and Brass Research Association and other groups already in existence.

The first object of the Copper Institute will be the assembling and distribution of full information regarding the consumption and sale of copper, as well as the study of costs of producing the metal. Concerning the conditions facing the consumption and sale of copper in foreign countries, it is expected that Copper Exporters, Inc., will play an important role. The institute itself will conduct wide surveys in the United States, covering the same points.

In order to establish a uniform cost accounting system for the whole United States, member companies will be requested to turn over all their cost statements to Price, Waterhouse & Co., accountants, of 56 Pine street, New York. The accountants will work out all the statements on a uniform basis, drawing up at the conclusion of this task a composite statement which will be given to the institute.

Cornelius F. Kelley, president of the Anaconda Copper Company, has been elected chairman of the executive committee, and F. H. Brownell, first vice-president of the American Smelting and Refining Company, will be president. The vice-presidents will be Stephen Birch, president of the Kennecott Copper Corporation, and Walter Douglas, president of the Phelps-Dodge Corporation. R. R. Eckert will be secretary and treasurer.

In addition to the above officers, with the exception of Mr. Eckert, the executive committee will include R. I. Agassiz, president of the Calumet and Hecla Consolidated Copper Company; James H. Anderson, secretary of the United Verde Copper Company; Gordon R. Campbell, president of the Calumet and Arizona Mining Company; C. W. Nichols, president of the Nichols Copper Company, and L. Vogelstein, chairman of the board of the American Metal Company.

Progress in Standardization

As reported in the A.S.M.E. News, work on standardization is progressing rapidly and the following "progress reports" are made by various committee chairmen:

Pipe Flanges and Flanged Fittings. Collins P. Bliss, chairman. The Sectional Committee on Pipe Flanges and Flanged Fittings has made considerable progress during the past year, having complete five of its standards for submission to the sponsors and A.E.S.C. for approval.

Sub-Committee on Screwed Fittings. Stanley G. Flagg, chairman. The standards for 125-lb. and 250-lb. cast-iron screwed fittings and 150-lb. malleable iron screwed fittings are before the A.E.S.C. for approval as tentative American standards. The proposed tentative American standard for long turn sprinkler fittings, the third standard to be drafted by this sub-committee, is now being voted on by the members of the sectional committee.

Identification of Piping Systems. Amos S. Hebble, chairman. This proposed scheme has been reedited during the past year and it is at present with the members of the sectional committee for vote by letter ballot.

Engineering and Scientific Symbols and Abbreviations. J. Franklin Meyer, chairman. The four sub-committees of the sectional committee have been active during the past year.

New York City Authorities Investigate Atmospheric Conditions

Under the direction of Health Commissioner Harris, of New York City, in co-operation with the U. S. Public Health Service, a study is being made of atmospheric conditions in New York. It is understood that the most objectionable feature disclosed to date is the high percentage of carbon-monoxide in air near the street level, as indicated by the analysis of samples taken throughout the city. It is stated that from 24 to 284 parts of carbon-monoxide per 1,000,000 parts of air represent typical conditions.

The studies that have been made are preliminary to additional studies that the Department of Health proposes to make in order to check up conditions as they are influenced by changes of seasons, weather, increased congestion of traffic and other factors. With the constantly growing use of motor vehicles, it is exceedingly important to have measurements made of conditions in various parts of the city for the benefit of physicians and the public in general in understanding the causes for symptoms that would otherwise be unexplainable. At the same time an investigation will be made into the extent to which soot and cinders pollute the atmosphere.

Heating Industry Closely Linked to Successful Oil-Burner Sales

SLOWLY it is becoming a recognized fact in the oil-burner industry that logical and healthy growth is dependent upon the maintenance of close relationships with the heating industry. Every problem of a technical nature that besets the oil-burner designer or engineer is part and parcel of technique within the realm of heating engineering. This much is readily admitted. But, when it comes to the marketing of oil burners, the desirability of a continued tie-in has not been so universally acknowledged.

Eighteen months ago, at a certain sales conference, four out of seven district sales executives expressed the belief that oil burners could be sold, and kept sold, with total disregard for the services or influence of the heating industry—just as sugar can be sold across the counter.

There is an admitted trend toward a more comprehensive appreciation of the function of the heating engineer and the heating contractor in this connection. Perhaps, in another year or two, the majority of oil-burner sales executives will realize the importance of developing and maintaining the closest possible relationship with the men who design heating systems and those who install them.

HEATING PLANT SURVEY SHOULD PRECEDE SALE

In the first place, no burner contract should be accepted by the manufacturer until a survey has been made of the heating plant by a competent man. Such a survey may cost from $25 to $50. Obviously such an expenditure is not contemplated in the prices asked for the burners in the low-price range. But at least $10 to $15 can be allowed in this class. For this sum it should be possible to determine if the burner has an even chance to perform as it should, or if the conditions are against it. In the latter case, the contract should not be accepted by the manufacturer, until arrangements have been made to rectify the objectionable conditions, if they can be changed. No oil burner should be sold that is handicapped before it is installed.

It is not sufficient to ask the purchaser if his heating plant has been satisfactory with coal, because operation with an oil burner is not predicated upon performance with coal. A warm-air furnace may be entirely satisfactory with coal, with a good chimney draft, yet the installation of a burner may be followed by gas or smoke leaking from the furnace because of the disintegration of the old cement in the joints.

If the home-owner reports that his coal-fired plant has kept his house warm during cold spells "except that northwest bedroom," it is not safe to assume that the added effectiveness of the plant, that usually follows when burning oil, will make this room comfortable. The reason for this failure to heat should be found and the cause corrected. Perhaps it is too little radiation or there may be some careless pipe-work. But in any case, the mere promise that the oil burner will rectify the trouble is manifestly but a bid for future trouble.

So no contract should be accepted by the manufacturer until a survey of the heating plant has been made, commensurate with the cost of the burner. This done, with the conditions found to be favorable or rectified as recommended by the survey, the burner, from this point of view, has a fair show.

The next step is handled by the installation crew, and this may mean a single man doing the entire job, or a group of specialists in the larger centers where such organization is justified by the volume of business. The details of the installation problem will be handled in another article; it is sufficient to include it as one of the problems of the sales organization until it is removed through the perfection of its operations.

CHARACTER OF INVESTIGATION VARIES WITH COST OF BURNER

It is obviously illogical to expect the same class of preliminary survey from the representative of a $500 burner that would be made prior to the installation of a $1000 job. The main requisite is a clean boiler or furnace; next, a clean, clear chimney, with positive means for setting the draft as desired; combustion space that is adequate to the requirements of the burner; sufficient secondary heating surface or "gas travel" as it is frequently called and a properly installed piping or leader system with ample and well placed radiators or registers.

In making a preliminary inspection of a heating plant, it soon becomes evident whether the boiler passages are comparatively clean, or whether they, and possibly the horizontal portion of the flue-pipe, are badly sooted. In the former case such cleaning as may be necessary probably can be done by the installation gang; if it is going to be a real job the owner should be acquainted with the situation, and either have the cleaning done, or agree on a fixed charge for this service, which is not properly a part of either survey or installation work.

This is mentioned because many oil-burner dealers, in their eagerness to build up business, will sail in and do any number of things beyond their province, each representing little outlay, but, in the aggregate, helping to offset a reasonable profit. Of course, in the thousand-dollar jobs, such tasks probably have been figured in already as a definite part of the installation costs.

What has been said of cleaning the boiler or furnace applies to the chimney, with the added injunction to see that the flue is clear throughout its length. This can be done from the top, with a mirror, if the flue is straight and the day bright, or it may be done by lowering a flash-lamp from the top, or in various other ways—but it must be done.

It is also essential that a proper damper be provided. This means, according to the Underwriters, a damper that cannot be set to cut off more than 80% of the flue-pipe area. This should be done by cutting away 20% of the area of the damper blade, preferably in the shape of a concentric circle. In addition to this requirement, the damper should be so arranged that it will stay at any point where set.

In a survey, preliminary to installing an oil burner, it is a matter of determining just what is available and putting it in the best of condition—there is seldom an opportunity for making a change unless it is essential. Here is a boiler or a furnace, and the question is "Can the burner under consideration be installed in that boiler or furnace and yield the results of which it is capable?"

CHECKING RADIATION AND PIPING MAY BE DIFFERENT

The last of our cited heating-plant factors that must be examined is the extent and location of radiation and the piping conveying heat thereto. The determination of the radiation follows any one of several methods employing empirical formulae—it is a simple matter to determine if any given radiator is large enough, and not a difficult or costly change to install a larger one, should it seem desirable. But a piping system once in place is more of a problem, and if it appears that insufficient or unsatisfactory heating is the result of some defect in size or arrangement of the piping, the proper procedure is to call in a competent heating engineer or contractor, just as a physician would be called in case of sickness.

The services of trained heating engineers are available in practically every

city where a heating season obtains, and much more satisfactory results will be secured with oil heating if the inspection work above outlined can be carried out under the direct supervision of such a man.

Certain sales executives in the oil-burner field have expressed themselv s as of the opinion that oil burners can be merchandised just as washing machines, electric refrigeration equipment or automobiles, disregarding the technicalities involved in providing heat for our homes. Nothing could be further from the truth. Oil-burner activities and the technique of heating must be co-ordinated to secure the best results, and closer contact between the technicians of both groups will be decidedly beneficial.

Stable Gas from Oil as Visualized by a Practical Engineer

By Arthur E. Grant

AFTER reading with a great deal of interest the article appearing in "Mercoids" and reprinted in THE HEATING AND VENTILATING MAGAZINE, I believe "Visualized Imagination" would have been a good caption for this, for undoubtedly it takes imagination and visualization to look so far ahead in advance of the present-day practice.

Undoubtedly, the gas machine is coming. Cold gases have been made from high test gasolines and even very low test gasolines, but unfortunately, this has been a limited field, due to the cost of the fuel medium. Gases made from this source range from $2.25 to $3.25 per thousand cubic feet and that, together with the cumbersome and costly machine necessary, makes this gas plant a luxury in place of a practical necessity.

At present, experiments are being carried along where the heavier oils, such as furnace oil and lighter distillates, are being vaporized by burning 3% to 4% of the fuel in a retort and smothering the balance of the vaporized oil by only admitting sufficient air for combination of this small percentage of the fuel. This method has been more or less successful, but still is not a practical proposition for general utility work.

Experiments are being made, more or less successfully, using this partial burning process and afterwards passing the vapors through a catalyzer. This method also shows considerable prospect for future utilization. However, it has not as yet reached a thoroughly practical point.

Vaporizing of oils in retorts and converting them into gases, utilizing about 1% of the gases thus generated for the distillation process, has run against a decided snag in retort carbonization. Many engineers are experimenting to prevent carbonization taking place in the retort. Oil may be distilled under certain temperatures without dropping the solids or coking the retort, but if temperatures are carried slightly higher, coking will take place almost immediately. Thermostatic elements have been too lagging in their actions to give consistent results. However, to my knowledge, other methods of regulation are being experimented with, and undoubtedly in the near future a method of controlling distillation within a given range of temperatures will be found. With this method gases can be made from distilled oils at 25c a thousand cubic feet. These fixed gases then will be available for use in kitchen ranges and for boilers for house heating purposes.

With a gas of this kind, it will be possible to use the present-day boilers designed for an illuminating gas, but I believe decided improvements will be made even in these boilers. Of course, there is a limit to possible efficiencies due to necessary stack losses.

This article has predicted results within ten years and I firmly believe it is too conservative in this estimate. Experiments along lines enumerated above and also along lines that I am not at present at liberty to disclose, convince me that five years from now, the gas-making machine will be an accomplished practical fact.

Organization of Research Committee on Fuels

A.S.M.E. Main Research Committee, upon recommendation of the Survey Committee of the Fuels Division, has organized a special Research Committee on Fuels. The field of the committee's interest covers the preparation, utilization, carbonization, and constitution of coal, and proposes to function along the following lines: (a) correlate existing information on fuels research in the four foregoing phases, (b) co-ordinate, where possible and advisable, present and proposed fuels research, and, (c) undertake research on specific projects for which there is demand.

At present, it is stated, there is a great deal of duplication and waste in the fuels field inasmuch as a large amount of research in fuels has been and is being done in this country and abroad by engineering schools, technical organizations, government bureaus and industry. Therefore correlation of existing information is of first importance. The committee held its first meeting at the time of the A.S.M.E. annual meeting in December, at which time definite plans were made for the work.

Oil Burning in the British Isles

However backward the Briton may have been in coming to what he is pleased to call "central heating plants" in his home, he is not lacking in initiative in taking up with oil heating as applied to the house heating installation. *The Heating and Ventilating Engineer*, a recently-established British magazine, is presenting a series of articles on "Oil Burning Apparatus for Central Heating and Hot Water Supply," along the same general lines of the series that has appeared in THE HEATING AND VENTILATING MAGAZINE for over two years. As a matter of fact, the articles in the November issue describe three separate systems and occupy more than one-eighth of the entire editorial contents of the issue.

A visiting English engineer and contractor states that there is a great deal of interest, at the present time, in domestic heating with oil. The most commonly used fuel is known as Deisel oil. approximating our 28-32° fuel in general characteristics. This is delivered by tank wagons, equipped with pumps for quick discharge but an American purchaser would be badly fuddled when paying his bill as he would be charged in "shillings per ton." Where storage capacity is not provided, delivery is made in steel drums of approximately 40-gal. capacity.

Oil Company Initiates a Weekly Delivery

From the *Nokol News* for December, it is learned that the Roxana Petroleum Company has started oil delivery to a large number of its customers on an entirely new and novel basis designed to prevent burner failure through lack of fuel. In what the company calls "Shell Super Service" the driver calls at the customer's home on a prearranged day of each week and puts in enough oil to fill the tank. The customer merely signs a contract for oil at a price based on tank-wagon delivery and the weekly service is rendered at the same rate as would obtain had the customer waited for his tank to become empty and taken an entire tankload at a time. This move is but one of many that will do much to solidify the oil-burner business.

Well-known Coal Dealer Turns to Oil

It is reported that Burns Brothers, of New York City, one of the largest retail coal dealers in the east, has entered the oil-fuel business. Many former customers of this company turned to oil fuel, the natural result being that the company made arrangements to supply 28-32°, 32-36° and 36-40° oil.

Yearly Production of Domestic Heating Apparatus Valued at Over $200,000,000

DATA based on the Biennial Census of Manufacturers, conducted by the Bureau of the Census, disclose the fact that steam fittings and steam and water heating apparatus, produced during the year 1925, had a value of no less than $228,929,985. For years there have been no definite figures as to the production of heating equipment, largely because the data were included in those for foundry and machine-shop products. The Bureau of the Census, however, has now segregated the products of the heating industry under a heading of "Steam Fittings and Steam and Hot Water Heating Apparatus." Separate data are given for gas and oil stoves and appliances, and for stoves and warm-air furnaces.

The products of the heating industry are listed as steam and water heating boilers, radiators, safety valves, vacuum gauges, heat regulators, coils, unions, flanges and similar fittings, and other classes of steam specialties.

The figures for 1914, 1919, 1921, 1923, and 1925, given in the accompanying table, contain not only the value of the products manufactured but the number of establishments, number of wage earners, and wages paid.

Special data published by the Bureau of the Census show the monthly production of cast-iron boilers and radiators. The figures for 1927 to July, and for the corresponding periods in 1926, are shown in Table 2.

In addition to the foregoing figures, the Bureau of the Census has undertaken the collection of statistics on new orders for steel boilers, with a special listing of steel heating boilers as differentiated from power boilers. These figures show a production of 6141 boilers during the eight months of 1927, from January through August, corresponding to a total radiation capacity of 2,991,754 sq. ft. The figures by months are given in Table 3.

TABLE 3. NEW ORDERS FOR STEEL BOILERS, 1927

	No.	Sq. Ft.
March	717	353,529
April	907	436,099
May	881	412,995
June	893	437,720
July	876	444,424
August	876	448,227

TABLE 1. PRODUCTION OF STEAM FITTINGS AND STEAM AND WATER HEATING APPARATUS IN THE UNITED STATES 1914-1925.
(Data for establishments with products under $5000 in value included for 1919 and 1914, but not for subsequent years.)

Year	Number of Establishments	Wage Earners (Average Number)	Wages	Paid for Contract Work	Cost of Materials[1]	Value of Products	Value Added by Manufacture[2]	Horse Power
1925	225	43,260	$63,979,276	$484,206	$77,356,905	$228,929,985	$151,573,080	109,313
1923	236	44,141	64,806,855	466,249	83,297,279	221,954,313	138,657,034	91,085
1921	274	30,808	39,596,053	124,127	50,213,402	127,366,887	77,153,485	
1919	261	36,686	45,742,525	39,910	72,016,393	160,285,488	88,269,095	67,494
1914	295	26,388	16,737,879	178,753	26,921,102	63,922,434	37,001,332	38,362

[1]Including also cost of fuel and electric power.
[2]Value of products less cost of materials.

TABLE 2. MONTHLY PRODUCTION OF CAST-IRON BOILERS AND RADIATORS

	1927					1926		CUMULATIVE TOTAL FROM JANUARY 1 THROUGH JULY 31		Per ct. increase (+) or decrease (−) cumulative 1927 from 1926
	March	April	May	June	July	June	July	1926	1927	
Cast-Iron Boilers and Radiators										
Round boilers:										
Production...thous. of lbs..	27,669	23,719	23,128	25,078	----------	20,962	17,058	129,898	136,960	+5.4
Shipments...thous. of lbs..	15,864	19,352	20,992	19,064	----------	16,883	20,882	93,407	104,094	+11.4
New orders...thous. of lbs..	19,404	17,627	23,086	23,568	----------	18,162	23,157	105,607	109,565	+3.7
Stocks, end of month...thous. of lbs..	101,393	106,225	108,721	114,432	----------	109,243	107,171	----------	----------	-------
Square boilers:										
Production...thous. of lbs..	25,437	20,442	21,367	25,561	----------	20,655	18,257	124,147	134,796	+8.6
Shipments...thous. of lbs..	13,132	16,164	18,539	18,509	----------	16,502	23,991	89,543	92,976	+3.8
New orders...thous. of lbs..	16,085	15,610	21,439	25,554	----------	18,214	27,904	103,765	102,057	−1.6
Stocks, end of month...thous. of lbs..	101,042	105,300	106,933	113,210	----------	114,515	111,713	----------	----------	-------
Radiators:										
Production...thous. sq. ft. heating surface..	17,261	15,326	14,797	16,242	----------	13,834	14,424	90,761	92,694	+2.1
Shipments...thous. sq. ft. heating surface..	8,965	10,594	12,965	11,756	----------	10,824	14,983	64,355	63,584	−1.2
New orders...thous. sq. ft. heating surface..	11,588	10,873	15,810	11,946	----------	13,486	16,243	84,741	66,850	−21.1
Stocks, end of month...thous. sq. ft. heating surface..	48,714	53,598	60,439	60,313	----------	53,638	52,915	----------	----------	-------

Legal Decisions

Agreement to Heat Premises and Control of Plant Makes Lessee Liable for Coal Hole Injury

The lessee of a store and basement in a three-story and basement building agreed in the lease to furnish heat for the whole building, the lessor agreeing to contribute 15 tons of coal each year. The lessee also agreed to keep the premises leased in repair and to indemnify the lessor for any injury to any person or property on the premises. The Massachusetts Supreme Judicial Court holds, in an action by a pedestrian for injuries caused by the tipping of the cover of a coal hole in the sidewalk over the basement, that the lessee was liable, the lease giving him the right to possession of the basement, and he, by his agreement to heat, undertaking the control of the furnace and of the appliances for the supply of coal. Although the lessor was bound to pay for or furnish 15 tons of coal, there was nothing to indicate that she retained any control of the basement or sidewalk, and it was agreed that no negligence of the coal dealer in putting in the coal contributed to the accident. The city, which was also made a defendant, was held not liable. Kelley v. Rubin, 156 N.E. 714.

Fire Box and Chimney Parts of Heating Plant But Not of Boiler, and Not Covered by Boiler Explosion Policy

Action was brought on a policy covering "loss resulting from damage to property of the assured" "caused by the explosion, collapse or rupture of any boiler described in the schedule" to the policy. A boiler insured was in the basement of the insured's hotel, and part of the heating plant. The flue or chimney extended upward in an outer wall of the building. An explosion occurred, caused by an accumulation of gas, which was the fuel used, in the fire box, when the operator undertook to light the gas jet. The explosion extended into the flue. Apart from slight damage to the boiler, the principal damage was to the wall through which the flue extended.

The insurance company contended the explosions in the fire box and chimney were not covered by the policy. The insured asserted that the boiler, the explosion or rupture of which was insured against, was a unit, and an explosion in any part thereof was covered by the policy, and the so-called fire box was in fact an integral part of the unit so insured.

The Texas Court of Civil Appeals held, Hartford Steam Boiler Inspection & Ins. Co. v. Kleinman, 293 S. W. 894, that the fire box and chimney were parts of the heating plant, but not parts of the boiler described in the policy, especially in view of a statement in the policy that "the word 'boiler' as used in this policy is understood to include also its steam pipe, feed pipe and a blow-off pipe up to and including the nearest stop valve; also the water column and its connections with the 'boiler,' the steam and water gages, and the safety valve; and 'boiler' is understood to mean also any vessel or other apparatus which is subject to internal pressure." The explosions having occurred in the fire box and chimney from gas there accumulated, it was held the resulting damage was not protected by the policy.

Sub-Contractor Held Bound By General Conditions Prefixed to Specifications

The general contractor for a school building, including the heating, ventilating, plumbing and mechanical equipment, sublet the plumbing and steamfitting work to a sub-contractor, Fraser, the work to be done according to the plans and specifications prepared by the engineers. The sub-contractor, by reference to the general conditions accompanying the specifications, adopted them. One of these conditions was that all material delivered on the premises should be held to be the property of the owner and should not be removed without the written consent of the engineer. Fraser contracted with plaintiff to furnish and install all pipe covering as per plans and specifications of the engineers. This contract did not specifically mention the general conditions. Plaintiff took stock material to the building to carry out the contract, and when it was partly installed, Fraser abandoned his contract with the general contractor after receiving about 90% of his contract price, and the general contractor refusing to pay over again if the plaintiff went ahead, the plaintiff endeavored to remove his unused material. He was stopped by the general contractor, when he sued in replevin to recover the material.

Plaintiff knew nothing of the general conditions. The question was: Was he bound by the specifications, including these general conditions? The trial court thought he was not and gave judgment in his favor. The general contractor sought a review of the decision. The Michigan Supreme Court, Morgan v. Goddard, 214 N.W. 155, holds that in taking the subcontract the plaintiff was bound to inform himself of the specifications and the general conditions must be held to have constituted a part of the specifications. The court said:

"The general conditions are printed matter and precede the specifications, but expressly made to apply thereto."

Lien for Heating Installation —Timely Filing

The tenant under a written lease of restaurant premises agreed to make certain alterations and to install and maintain a good and sufficient ventilating system in the premises and install all the plumbing. The tenant contracted for the labor and materials necessary to make the alterations. After completion of the work the various contractors filed liens therefor. The owner of the building contended the liens were invalid, in so far as the work was done without his written consent and approval as required by the lease and that the cost exceeded the tenant's estimate furnished to him. He also contended the lien for the plumbing and heating work was filed too late, and after the statutory period of four months from completion. The New York Appellate Division, Fourth Department, holds, Boyle v. Paolini Cafeteria & Restaurant, 222 N. Y. Supp. 19, that the case itself authorized the tenant to make the alterations made, which merely amounted to the contemplated refitting of the space rented. The fact that the cost exceeded the tenant's estimate did not negative the existence of consent, latitude being allowed to the tenant to determine the character of the alterations.

The heating and plumbing contractor's work consisted of installing plumbing, pipes and pipe connections, including hot-water heating apparatus. For some of this work a written contract was made. A large part, not covered by the written contract, proceeded simultaneously with the contract work. On April 25, 1925, all the work seemed to be complete, except that, upon the test by actual use on the opening of the restaurant on April 17, 1925, the boiler in the heating apparatus was found insufficient, and replacement by a larger size was ordered. This was thereafter done. Thus there was a cessation of work from April 25 to May 8. The work of replacing the boiler began May 8 and was finished June 19. But during this time the contractor's equipment remained on the property. The lien was filed September 21. If the work was completed on April 25, and the replacing of the boiler was construed as a new and unconnected matter, the filing of the notice of lien was too late. The court was of opinion, however, that the entire service rendered by the contractor was single and continuous, and that the filing of the lien was timely.

The lease, however, created no agency of the tenant for the owner, so as to make the owner personally liable on the tenant's contracts.

AIR CONDITIONING
Calculations for a Typical Theater

NOTE—The following data have been selected from an article entitled, "Original Design Data for Theater Air Cooling" by S. L. Goodwin, published in THE HEATING AND VENTILATING MAGAZINE for March and April, 1927. The reader is referred to this article for a more complete discussion of the subject.

In cooling air for theaters the sources of heat production must be considered and carefully computed before any working basis can be established. Practical experience has indicated that air cannot be injected into an occupied auditorium at a temperature more than 14° F. below the auditorium temperature without danger of producing disagreeable and even dangerous cold drafts. This immediately limits the amount of cooling effect which can be obtained with a cubic foot of air to about ¼ of a B.T.U., as the air only can be warmed (or absorb heat) from its initial entering temperature up to the auditorium temperature. Therefore, it will take four times as many cubic feet of air *per hour* to remove the heat produced in the same period as there are B.T.U. to be removed.

Taking a theater of the usual size, seating about 3000 persons, the calculations for sources and amount of heat produced—and, therefore, to be removed—are shown in Table 1. It will be noted that the heat to be removed is the aggregate from three distinct and separate sources:

TABLE 1. TOTAL HEAT TO BE REMOVED IN SUMMER

	B.T.U.
Body Heat—3000 S × 350 B	1,050,000
Roof—100 ft. × 112 ft. × $\frac{0.57t}{2\,HC}$ × 25° d	79,800
Walls—112 ft. × 60 ft. × 2 Sides × 0.25t × 25° d	84,000
Electricity $\frac{100{,}000\ W. \times 3.415\ w.}{4f}$	87,900
Total Amount of Heat in Summer, per hr	1,301,700

In the above table:

S—Seating capacity of auditorium, including standees.
B—Body heat in B.T.U. per hour.
t—Transmission of heat in B.T.U. per square foot, per hour, per degree difference in temperature.
H.C.—Hung plaster ceiling; approx. one-half transmission.
d—Degrees of temperature range.
W—Watts of electric current.
w—B.T.U. per watt, or 3.415.
f—Electrical factor; approx. one-quarter load.

First, is the body heat or heat generated by the occupants of the theater. Second, there is the warming effect of the walls and roof, due to a higher temperature existing outside of the theater than inside, this being figured the same as ordinary heat loss, except that it is limited to the temperature difference, to be carried in warm weather, between the inside of the theater and the outside temperature. Third, is the heat produced by the electric lighting and apparatus.

(*Continued on Data Sheet No. 20-M*)

AIR CONDITIONING
Calculations for a Typical Theater
(*Continued from Data Sheet No. 20-L*)

TABLE 2. QUANTITY OF AIR REQUIRED

Cu. Ft. per Min.	C.F.M.
$\frac{1{,}301{,}700\ B.T.U. \times 4\ (Cu.\ Ft.\ per\ B.T.U.)}{60\ (Minutes\ per\ Hour)}$	87,000
$\frac{87{,}000\ C.F.M.}{3000\ (Seats)}$ per Person in Auditorium Allowing 14° Range of Temp.	29

In Table 2 is given the method of calculating the quantity of air required per minute and the quantity per person, as worked out by this method, which shows about 29 C.F.M. per person. The least quantity per person that is usually found is not less than 25 C.F.M. and 30 C.F.M. is about normal. With allowance for standees, the air to be supplied to the auditorium being considered would approximate 100,000 C.F.M. This would be divided up into a certain amount of fresh air, a certain amount of recirculated air, and a small allowance for the lobby.

AIR DISPLACEMENT AND WATER TO BE REMOVED

This 100,000 C.F.M. would be divided up about as shown in Table 3 and the surplus moisture would have to be removed from the fresh, incoming air. The amount of water to be removed—assuming an outside temperature of 90° F. and a relative humidity of 55%, when compared to the condition of the air leaving the cooler, this being assumed as 59° F. and saturated—proves to be 2.57 grains per cubic foot. The supply fan capacity, with an allowance for standees, is also given in Table 3.

TABLE 3

Fresh Air Make-Up

	Grains per Cu. Ft.
90° E— 55% Rel. Humidity	= 8.13
59° D—100% Rel. Humidity	= 5.56
Water Removed from Fresh Air	= 2.57

Supply Fan Capacity

	C.F.M.
Small Lobby (wasted)	10,000
Theater (fresh air make-up, not recirculated)	15,000
Auditorium (recirculated air)	75,000
Total Supply	100,000

In the above table:

E—Exterior air temperature in degrees F.
D—Dehumidified air temperature in degrees F.

(*Continued on Data Sheet No. 20-N*)

How Would You Do It?

Question 5

A swimming pool contains 20,000 gal. of water and it is desired to change the water once a week and heat the fresh water up to 70° F., in a period of 12 hours. Assuming that there is no appreciable heat loss from the pool while it is being heated and that the water never comes into the pool at less than 45° F., how much boiler capacity (horse-power) would be required, and what would be the simplest method of applying the heat?

IN order to compute the boiler horsepower required to heat the swimming pool water under the given conditions, it is first necessary to compute the weight of the water to be heated. The pool contains 20,000 gal. of water and, as water weighs about 8 1/3 lbs. to a gal., the total weight of the water to be heated is

$$20{,}000 \times 8\ 1/3 = 166{,}667 \text{ lbs.}$$

With a minimum incoming water temperature of 45° F., and a pool temperature desired of 70° F., the water must be raised

$$70° - 45° = 25° \text{ F.}$$

So with a total of 166,667 lbs. of water and a temperature rise of 25° F. to be made, the total B.T.U. which must be delivered to the water will be

$$166{,}667 \times 25 = 4{,}166{,}675 \text{ B.T.U.}$$

Fortunately all this heat does not have to be delivered in one hour; if it had, the apparatus would be unnecessarily large and the expense of installation probably prohibitive. According to the conditions of the problem a period of 12 hours can be utilized to heat the new charge of water when the pool is refilled. So the heat *per hour* is only a fraction of the total heat, and may be determined by dividing the total heat by the number of hours in which the heating can be done. This will give

$$\frac{4{,}166{,}675}{12} = 347{,}223 \text{ B.T.U. per hr.}$$

In figuring a problem of this kind it is usual to allow 30,000 B.T.U. output per boiler horsepower which, while not exactly correct, provides a small surplus to take care of pipe losses and contingencies. Therefore the approximate boiler horsepower can be determined by dividing the B.T.U. per hr. by 30,000 or

$$\frac{347{,}223}{30{,}000} = 11.5 \text{ Boiler H.P.}$$

The second part of the problem has no hard-and-fast solution, as opinions will differ as to the best and simplest method of heating the pool; for instance, there are pools heated by the direct injection of steam under pressure; by circulating the water through the heating boiler; by using steam-type multi-tube heaters, and so on. The injection of live steam into the pool is objectionable in many ways and so will not be considered here. Circulating water through the heating boiler is a very simple method and allowing the incoming water to flow through an instantaneous steam heater is another, almost as simple.

First, considering the method of circulating water through the boiler, generally it will be found that the pool—on account of its great weight—is set on the ground, if possible, so as to bring the heavy load on bearing soil instead of having to support it on the building construction. Pools have been put in the upper stories of buildings but, in general, the proposition holds. This being so, it is unlikely that the boiler can be set low enough to get a gravity circulation through the pool.

In such a case a circulating pump must be used and the capacity of this pump will be

$$\frac{20{,}000}{12 \times 60} = 28 \text{ g.p.m.}$$

if the water is pumped through the boiler only once in the 12 hours. This means a small pump and a small motor, and there is the possibility that the water passing through the boiler in such small quantity might become overheated—that is, heated above the boiling point so that it would make steam.

To determine this fact it will be necessary to compute the pounds of water passing through the boiler every hour and to see to what temperature the B.T.U. delivered by the boiler during the same period would raise the water. With a circulation of 28 g.p.m. the number of pounds of water passing through the boiler every hour is

$$28 \times 8.33 \times 60 = 14{,}000 \text{ lbs.}$$

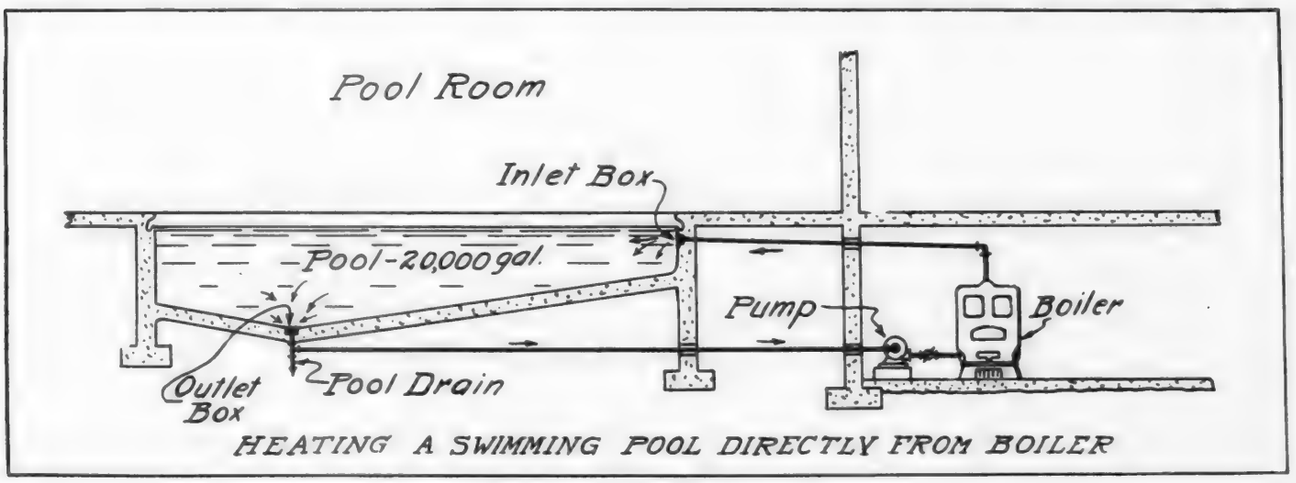
and the boiler imparts to the water during an hourly period 347,223 B.T.U. As each B.T.U. will raise one pound of water 1° F., it will take 14,000 B.T.U. to raise 14,000 lbs. of water 1° F., and with 347,223 B.T.U. the number of degrees rise will be

$$\frac{347{,}000}{14{,}000} = 25° \text{ F.}$$

As the water in the pool is never over 70° F., it is plain that there will be no danger of boiling the water, as the worst case would be

$$70° + 25° = 95° \text{ F. maximum temperature of water delivered.}$$

In cases where a separate boiler is not provided for swimming-pool heating, practically the same method of operation can be used if an instantaneous steam heater is substituted in place of the boiler. The instantaneous heater must be supplied with steam from the steam boiler and the boiler load will practically be the same as before. This



HEATING A SWIMMING POOL DIRECTLY FROM BOILER

Problem Presented in Question 5

arrangement has the advantage of using a single boiler—or group of boilers—for heating the pool, heating shower-water for use in the pool showers and possibly heating the building at the same time.

By arranging to heat the pool at night it often is possible to use the boiler capacity, which is required to heat the building in the day time, and to throw this capacity to the pool at night, thus making a separate boiler for the pool unnecessary. Owing to the fact, however, that this rather confines the refilling of the pool, or the heating of the fresh water, to a night time period, and also to the possibility of it being desirable to change this particular feature at some later date, the additional boiler capacity is desirable in all cases when financial considerations permit.

Accuracy of Degree-Day Basis for Figuring Coal Consumption

SINCE compiling the data published in THE HEATING AND VENTILATING MAGAZINE for October, 1927, on "Heating a Ten-Room House With No. 1 Buckwheat Coal," the author, H. A. Ward, whose home at 206 Elmwood Ave., Ithaca, N. Y., is the one under discussion, has taken the figures for coal consumption from January to May to determine the amount of coal burned per degree-day during that period. The result is an impressive demonstration of the accuracy of the degree-day method in estimating heating loads.

It will be noted from the table that for the first three weeks, the system was not operating at its highest efficiency. The maximum deviation from the average of 3.45 lbs. of coal per degree-day, leaving out the mild month of May, is plus 8% for the week of January 15, and minus 10% the week of April 16.

The figures for the period from November 7 to December 12 indicate an average consumption of 4.18 lbs. of coal per degree-day. This, it is explained, is not inconsistent, as the coal used was comparatively poor. The ash averaged 22% while the fire clinkered and in other ways acted differently during the period from January to May.

"On the whole," comments the author, "these data point to an easy way of comparing quite accurately the results obtained in heating."

RELATION OF COAL CONSUMPTION TO DEGREE-DAYS IN ITHACA RESIDENCE

Week Ending	1 Coal, Lbs.	2 Sum of Mean Daily Temperatures, Deg. F.	3 455—Col. 2 Degree-Days	Col. 1/Col. 3 Coal per Degree-Day Lbs.
Jan. 8	1147	143	312	3.7
15	1231	128	327	3.75
22	892	214	241	3.7
29	1011	140	315	3.2
Feb. 5	861	211	244	3.53
12	827	215	240	3.45
19	880	197	258	3.4
26	755	223	232	3.25
Mar. 5	933	165	290	3.2
12	637	279	176	3.6
19	423	335	120	3.52
26	764	240	215	3.55
Apr. 2	658	254	201	3.25
9	679	262	193	3.5
16	468	304	151	3.1
23	275	379	76	3.6
30	574	289	166	3.45
May 7	298	356	99	3.1
14	214	392	63	3.4
21	339	378	77	4.4
28	213	381	74	2.9
	14079		4070	

14079/4070 = 3.45 average coal consumption per degree-day.
In Col. 3 455 is the product of 65° times 7 days.

SEASON 1927

Nov. 7	723	283	172	4.2
14	700	284	171	4.1
21	744	279	176	4.2
28	658	319	136	4.8
Dec. 5	852	227	228	3.75
12	913	238	217	4.2
			Average	4.18

Canadian Government Sponsors House Insulation

"Why You Should Insulate Your Home" is the title of a carefully worked-out booklet prepared by the Department of the Interior for the Dominion Fuel Board of Canada and, apparently, circulated more in the interests of fuel conservation than in support of insulation manufacturers. It is stated that the proper insulation of all residences in Canada would result in annual fuel saving of at least $30,000,000, of which $7,000,000 would be saved in Montreal, Toronto, Hamilton and Ottawa alone. In the presentation, attention is drawn to tests made by Prof. J. C. Peebles, of the Armour Institute of Technology, Chicago, Professor Greig, of the University of Saskatoon, and Director Houghten, of the Research Laboratory, Pittsburgh. It is aptly stated, under the head of "Costs," that insulating a new house at an expenditure of from 3% to 5% of the total cost of the building "may well be termed comfort insurance." The entire presentation is non-technical and it is obviously designed for the average home owner.

Market Research Agencies

A publication that should be of considerable value has been prepared by the United States Department of Commerce under the title "Market Research Agencies." This is a guide to publications and activities relating to domestic marketing. It is arranged as an index of the activities, first, of federal departments and branches of the federal government in developing data of value to merchandisers of almost every conceivable commodity. The second section relates to activities of state and municipal governments; the third, to colleges, universities and foundations; the fourth, to book publishers, and a fifth, to such commercial organizations as advertising agencies, chambers of commerce, co-operative associations, magazines, newspapers and trade associations. This is a remarkably comprehensive publication and can be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 15c per copy. It is issued in conventional government bulletin form, 5½ in. x 9 in., and contains 156 pages.

A Correction

In enumerating the executive personnel of the newly-organized Heat Transfer Products, Inc., in THE HEATING AND VENTILATING MAGAZINE for December, the statement was made that Sylvan J. Crooker, vice-president in charge of engineering, had been chief engineer of the Whitlock Coil Pipe Company. It develops that Mr. Crooker had been a member of the engineering staff of the Whitlock company, but not its chief engineer.

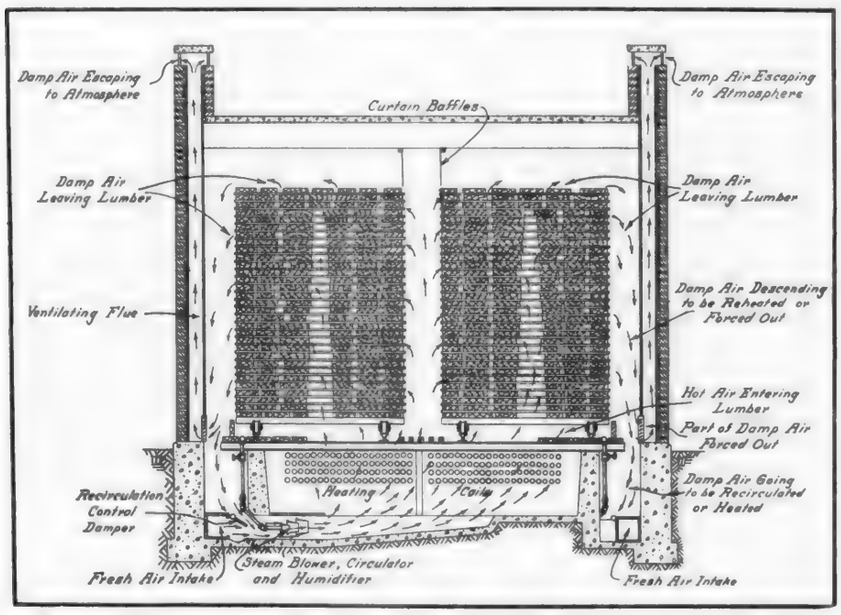

Damp Air Escaping to Atmosphere
Curtain Baffles
Damp Air Escaping to Atmosphere
Damp Air Leaving Lumber
Damp Air Leaving Lumber
Ventilating Flue
Damp Air Descending to be Reheated or Forced Out
Hot Air Entering Lumber
Part of Damp Air Forced Out
Heating Coils
Damp Air Going to be Recirculated or Heated
Recirculation Control Damper
Steam Blower, Circulator and Humidifier
Fresh Air Intake
Fresh Air Intake

Fig. 1. Typical Arrangement of a Steam Jet Type of Lumber Dry Kiln

Design of Lumber Dry Kilns

Part V

By Harold L. Alt

AMONG the many novel ideas embodied in the numerous designs of lumber dry kilns is that of the steam jet blower dry kiln, as designed and manufactured by the Henderson Drying Equipment Corp., Syracuse, N. Y. This outfit is a blower dry kiln without a fan, the blower referring to a steam jet which produces a circulation of air and, incidentally, more rapid drying by means of the injector action produced by the steam jet.

This kiln is illustrated in Fig. 1. It will be noted that the fresh air enters at the bottom on the left-hand side and is drawn by the injector action of the jet into the kiln where it mixes with the recirculation air coming down from the top. The mixture then passes up through the heating coils where it is heated up to the required temperature.

The purpose of the steam jet blower is three-fold, consisting of supplying the required amount of moisture to the incoming air, preheating this incoming air to some extent before it reaches the heating coils and producing a suction at the air inlet and a pressure within the kiln, thus positively drawing in fresh air and forcing out a part of the damp air which is not recirculated.

Dampers located on the fresh air ducts permit the regulating of the proportionate amount of recirculation air and fresh air used and during the steaming period all fresh air can be closed off and only recirculated air used. Later on in the drying process, when a very low humidity is desired, fresh air only with its accompanying dryness can be supplied by using air from the fresh-air intake.

Thermostats are arranged so as accurately to control the temperature of the air going to the lumber by controlling the amount of steam admitted to the heating coils.

As the manufacturer states, the drying of lumber is not one solely of evaporation and heat alone is not sufficient. To satisfactorily dry lumber it is not only necessary to withdraw the moisture from the center of the timber but also to do it while preventing—at the same time—the drying of the surface too rapidly. The relative humidity maintained in the kiln determines the rate of evaporation from the surface of the lumber and can be controlled so as to prevent the drying of the surface at so fast a rate as to interfere with the escape of the internal moisture.

Even with the proper temperature and relative humidity an adequate amount of circulation must be carried on if rapid and even drying is to result; without such circulation there will be places where the lumber will dry too slowly and other places where the process will be concentrated, such as immediately above the heating coils. Ideal circulation is embodied in an air movement which is rapid enough to prevent undue change in the temperature and humidity of the air as it travels through the piles of lumber and, at the same time, pick up and evaporate all the moisture coming to the surface of the wood.

Gravity chimneys or flues, of course, are influenced by outside wind conditions and instances are known where even reversed air flow has been produced in such stacks. With the steam blower no such difficulties are likely to be encountered as its action is positive; moreover the steam utilized need not be more than

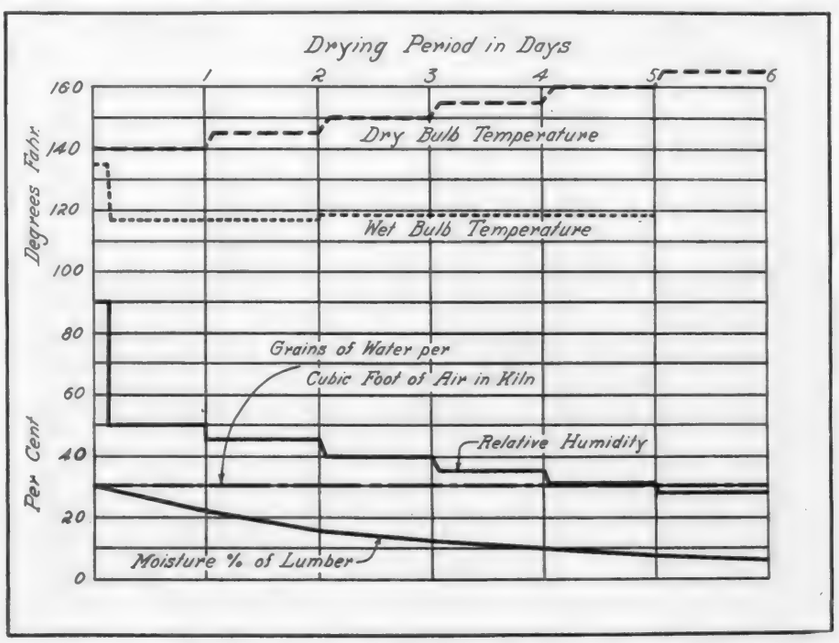


Fig. 2. Chart Showing Air and Moisture Conditions During an Ordinary Lumber Drying Process

otherwise would be required for humidifying purposes alone.

AIR CIRCULATION OF 25 CU. FT. PER MINUTE REQUIRED

According to Bulletin 1136, U. S. Department of Agriculture, the Forest Products Laboratory recommends, for all difficult drying work which demands uniform drying conditions, a circulation of at least 25 ft. per minute through the lumber piles, and the manufacturer states that the steam jet kiln will give this much circulation during all periods of drying without using more steam to supply the blower than the humidity requirements would demand in any event.

The amount of steam necessary during the drying process to supply the humidity advisable does not vary to any appreciable extent although many dry-kiln operators are under the impression that this changes to a considerable degree. What really happens is that, while the temperature and relative humidity alter as the drying process proceeds, the actual amount of water vapor per cubic foot of air circulated in the kiln remains practically the same.

This will appear more clearly by reference to the chart shown in Fig. 2, which represents a typical drying schedule and has drawn thereon lines indicating the dry-bulb temperatures, wet-bulb temperatures, relative humidities and moisture content of the lumber. From these it is very easy to compute the number of grains of moisture per cubic foot of air in the kiln and this also has been plotted on the chart. It will be noted that with the exception of the initial steaming period the grains of moisture remain practically at 30 grains per cubic foot throughout the process.

Applications of Winslow Commercial Oil Burners

A novel presentation of the application of Winslow oil burners to hotels and apartment houses has been prepared by the Winslow Boiler & Engineering Co., Chicago. The text is printed in elite type, the illustrations are exceptionally fine photographs on glossy paper, pasted in, and the diagrams are real blueprints, inserted.

Illustrating the possibilities of space-saving through the use of fluid fuel, there are illustrated two ground-floor plans for apartment buildings having no excavated cellars—the boiler room being on the ground floor. It is stated that the clean, quiet operation of these burners makes it possible to have apartments immediately adjacent to the boiler room. The advantage of such installation, where property values are high, is obvious. In one instance, there is shown an elaborate arrangement of trunk storage in a space that ordinarily would be used for coal.

A photograph is shown of a small, yet beautiful apartment building in the midst of Chicago's Gold Coast. It is stated that construction costs were materially reduced through the use of oil-burning equipment, as excavating was eliminated except for a very small boiler and machinery room. Attention is called to the fact that because oil is burned in this building, it was unnecessary to construct the high chimney that would have been required with solid fuel on account of the height of adjacent buildings. An 18-story apartment hotel also is pictured, and the statement made that the entire mechanical equipment of this building is taken care of by two men, this economy and the extraordinary cleanliness of the basement being due to the use of oil fuel.

Hotels of This Size Use Oil Fuel

An interesting type of the small hotel also is shown in photograph and blueprint. In this building the lobby, restaurant, office, double apartments and laundries are on the same floor as the boiler room—some of the apartment space actually adjoining the boiler space.

The 25 pages of this presentation appear to be "strong medicine" for the organization whose installations are portrayed, as it is noticeably a logical argument, free from exaggerated statements of economies obtained and of well-nigh impossible performance. As a whole, it is one of the strongest selling arguments that has been formulated by an oil-burner manufacturer.

Modern Boiler Room Showing Installation of Winslow Commercial Burners

"Compensation rights in the Longshoremen's and Harbor Workers' Compensation Act," which became effective last July, apply to tradesmen who occasionally work aboard vessels, and for employees who are sent on board for any purpose connected with the ship's business. Compensation ranges from $8 to $25 per week in addition to medical expense, and provision is made for dependents in case of death from injury. In view of the penalties set forth in the law for employers neglecting to carry insurance protection, a fine of $1000 and imprisonment are provided for failure to comply with these provisions.

National Warm-Air Heating and Ventilating Association

Merger Proposed of Warm-Air Furnace Associations

A PROPOSAL was made by the National Warm-Air Heating and Ventilating Association, at its mid-year meeting in Urbana, Ill., November 30-December 1, to effect an affiliation with the Western Warm-Air Furnace and Supply Association and the Midland Club. A motion to invite these two organizations to amalgamate with the N.W.A.H. & V.A. was offered by Past-President E. B. Langenberg and was adopted by the meeting. Mr. Langenberg gave as a reason for a consolidation the necessity of avoiding, as far as possible, duplication of effort.

In his opening address President Charles E. Hall commented on present conditions in the warm-air furnace field with the statement that "we have all had the surprise of our business lives, during the past few months, when that Fall rush of business, to which we have been accustomed, failed to arrive." In attempting to explain this condition he stated: "General adverse conditions have had some effect, no doubt. What brought about these general conditions is a matter of conjecture. Do you realize that, as far as our industry is concerned, we ourselves are responsible for a great portion of the slump that has come to us?

"Just so long as some of us continue the present price-war competition, ignore the tenets of the Standard Code, and encourage our dealers to slap furnaces in, at any price to get the business, regardless of the service they render to the users, just that long will the furnace business continue to suffer a slump in sales.

"We are our own worst enemies. We are standing in our own light, retarding, hampering, and interfering with progress, and the increase of sales that good furnaces and good installations will surely bring.

"If every furnace dealer would, from this time on, never make an installation, except in accordance with the Standard Code, the sale of warm-air furnaces would probably be four times as great within the next two or three years."

In presenting the report for the Standard Code Committee, Prof. J. D. Hoffman, of Purdue University, moved the adoption of the ordinance form for the Standard Code upon which the committee has been working. This suggestion was adopted and the Standard Code Ordinance Form, as it will be known, will soon be available upon application to Secretary A. W. Williams, Columbus, O.

INSURANCE COMPANIES OPPOSING WARM-AIR FURNACES FOR GARAGE HEATING

Garage heating by warm-air furnaces came up for discussion when E. K. Campbell of the Campbell Heating Co., Kansas City, Mo., called attention to the fact that the insurance people are taking an attitude of antagonism toward the use of warm-air furnaces in garages. According to Mr. Campbell, garage heating by warm-air faces almost complete obliteration. He made the point that the dangers of carbon monoxide poisoning play into the hands of warm-air heating men instead of otherwise, because this danger lies in the air pockets that are formed. Air in motion, he pointed out, would eliminate the danger and this could not be insured by the ordinary steam or water system. He thought the association could perform a valuable service for the industry by convincing the insurance interests that their attitude was wrong in this connection.

In consequence of Mr. Campbell's statement, a committee of three, composed of E. B. Langenberg, A. M. Daniels and L. W. Millis, was appointed to confer with the association's representative on a committee of the A.S.H. & V.E. which is considering the general problem of garage heating and ventilation.

For the Publicity Committee, H. T. Richardson, chairman, announced that his committee has prepared a new manual for the protection of members of the association, entitled "Warm-Air Furnace Dealers' Manual." This manual is for the sole use of furnace dealers representing members of the N.W.A.H. & V.A. It is devoted to data for the furnace installer and contains information to guide him in his conduct of business.

An entire session on the second day of the meeting was devoted to research work at the association's Research Residence at Urbana, Ill. Following an inspection trip through the Research Residence, led by Professors Willard, Kratz and Day, the party returned to the meeting room at the Urbana-Lincoln Hotel, where Dean M. S. Ketchum of the College of Engineering, and director of the Engineering Experiment Station of the University of Illinois, delivered an address on research work with particular reference to that being carried on at the University of Illinois.

Dean Ketchum stated that there are now 80 established research projects underway at the university, involving an expenditure of some $200,000 a year. Thirty-two men spend full time, twenty spend half time on research work alone, while another fifty men are doing research work as a part of their regular college work. These latter are not on the payroll of the university, but are working for degrees of master and doctor.

Prof. A. C. Willard reviewed the work of research on warm-air furnace heating from its inception in 1918. He was followed by Professors Day and Kratz, who told of the research work that has been accomplished since the Cleveland meeting last April. These reports, it was announced, will be available as soon as they are issued in bulletin form by the University of Illinois.

L. W. Arny Resigns as Director of Public Relations

L. Wayne Arny, who has been in charge of the publicity work of the National Warm-Air Heating and Ventilating Association since June, 1925, has resigned his position, effective January 1, to become advertising manager of the Richardson & Boynton Company, New York. He succeeds William M. Chamberlain, who leaves the Richardson & Boynton Company to associate himself with a banking house in New York.

Eugene D. Milener With American Gas Association

Eugene D. Milener, who has been with the Consolidated Gas Electric Light and Power Company of Baltimore, Md., for several years, is now industrial gas research representative of the A.G.A.

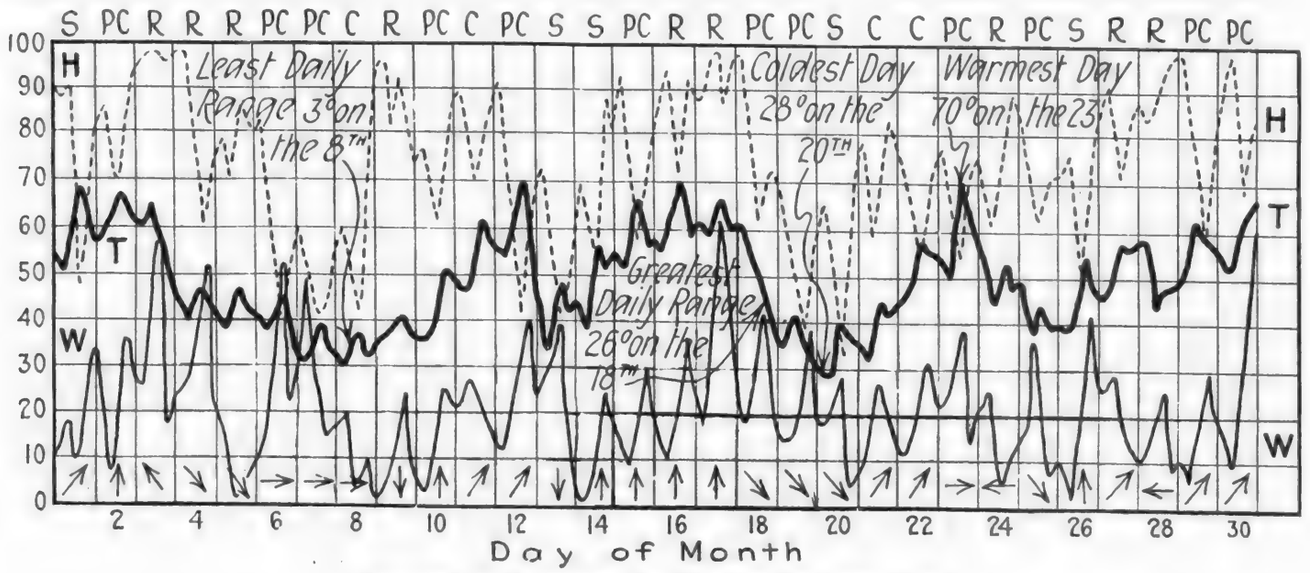
Mr. Milener's new duties will include contact and field work for the A.G.A. committee on research in industrial gas utilization. This committee has direct charge of the $500,000 research program of the association. After graduating from Baltimore Polytechnic Institute and the University of Maryland, he entered the employ of the Baltimore company in 1910, and since that time has served in various departments, including merchandise, main extension, general service, house heating, and industrial fuel.

In 1915 and 1916 Mr. Milener conducted original tests in Baltimore from which the gas house-heating business of the city has developed. When he severed his connection in Baltimore, he was supervisor of fuel sales.

Mr. Milener has been especially active in committee work for the American Gas Association. He has served on the managing committee of the commercial section and the industrial gas section. He acted as chairman of the committee which prepared the approval requirements for central gas-fired house-heating appliances.

The Weather for November, 1927

	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F	70	76	73	75	80
Date of highest temperature	23	23	15	1	1
Lowest temperature, degrees F	28	26	24	23	27
Date of lowest temperature	20	20	19	18	18
Greatest daily range, degrees F	26	30	35	31	37
Date of greatest daily range	18	18	30	11	11
Least daily range, degrees F	6	7	3	4	3
Date of least daily range	9	27	8	17	7
Mean temperature for month, degrees F	48.6	49.6	47.2	43.2	48.0
Normal mean temp. for month, degrees F	44.2	42.0	43.2	40.1	45.4
Total rainfall, inches	3.95	4.71	5.18	4.66	5.56
Total snowfall, inches	3.44	4.10	2.55	2.50	2.88
Normal precipitation, this month, inches	Trace	0.5	Trace	4.9	0.8
Total wind movement, miles	13557	7876	9850	9157	11552
Average hourly wind velocity, miles	18.8	10.6	13.7	12.7	16.0
Prevailing direction of wind	S.W.	S.W.	S.W.	N.W.	S.W.
Number of clear days	5	4	3	2	8
Number of partly cloudy days	12	13	5	6	7
Number of cloudy days	13	13	22	22	15
Number of days on which rain fell	14	11	16	15	11
Number of days with snow	One	One	One	2	0.8
Snow on ground at end of month, inches	None	None	None	None	0.7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Coldest Day 28° on the 20TH
Warmest Day 70° on the 23
Greatest Daily Range 26° on the 18TH
100 90 80 70 60 50 40 30 20 10 0
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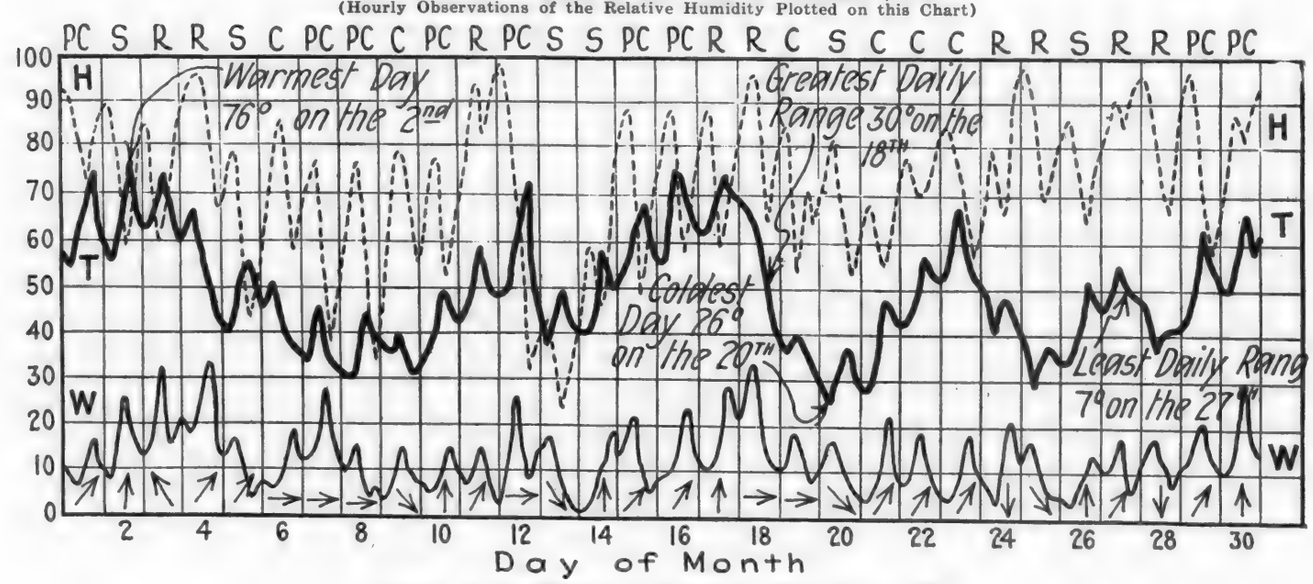
Day of Month

Record of the Weather in New York for November, 1927
(Hourly Observations of the Relative Humidity Plotted on this Chart)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Warmest Day 76° on the 2ND
Greatest Daily Range 30° on the 18TH
Coldest Day 26° on the 20TH
Least Daily Rang 7° on the 27
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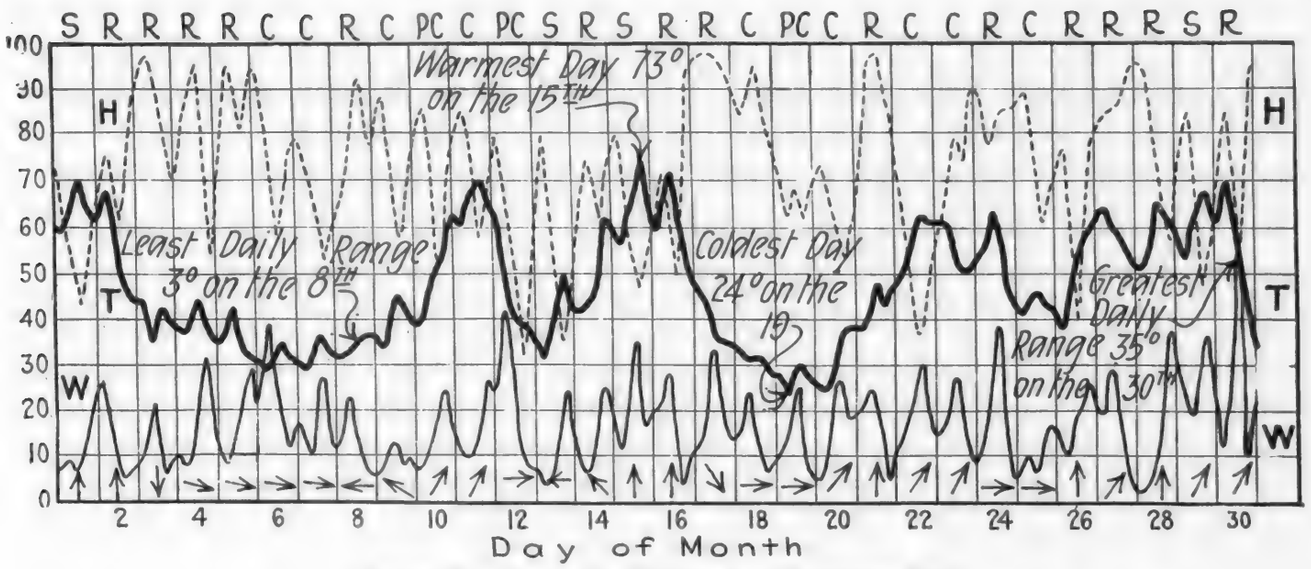
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

Record of the Weather in Boston for November, 1927


S R R R R C C R C PC C PC S R S R R C PC C R C C R C R R R S R
Warmest Day 73° on the 15th
Least Daily Range 3° on the 8th
Coldest Day 24° on the 19
Greatest Daily Range 35° on the 30th
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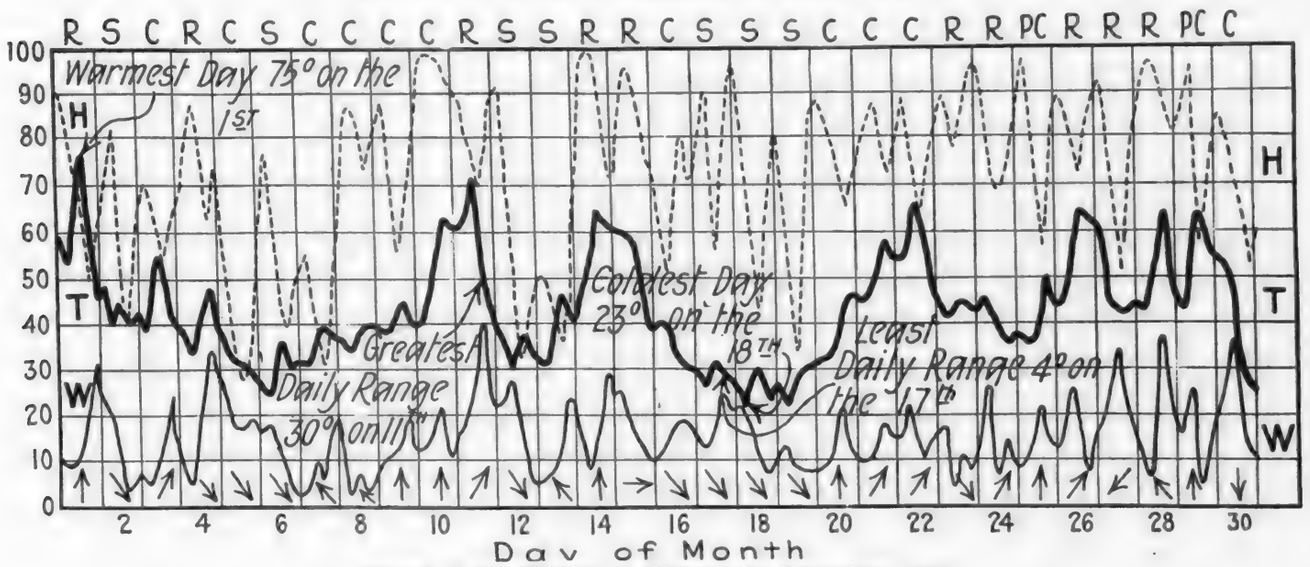
Day of Month

Record of the Weather in Pittsburgh for November, 1927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Warmest Day 75° on the 1st
Greatest Daily Range 30° on the 11th
Coldest Day 23° on the 18th
Least Daily Range 4° on the 17th
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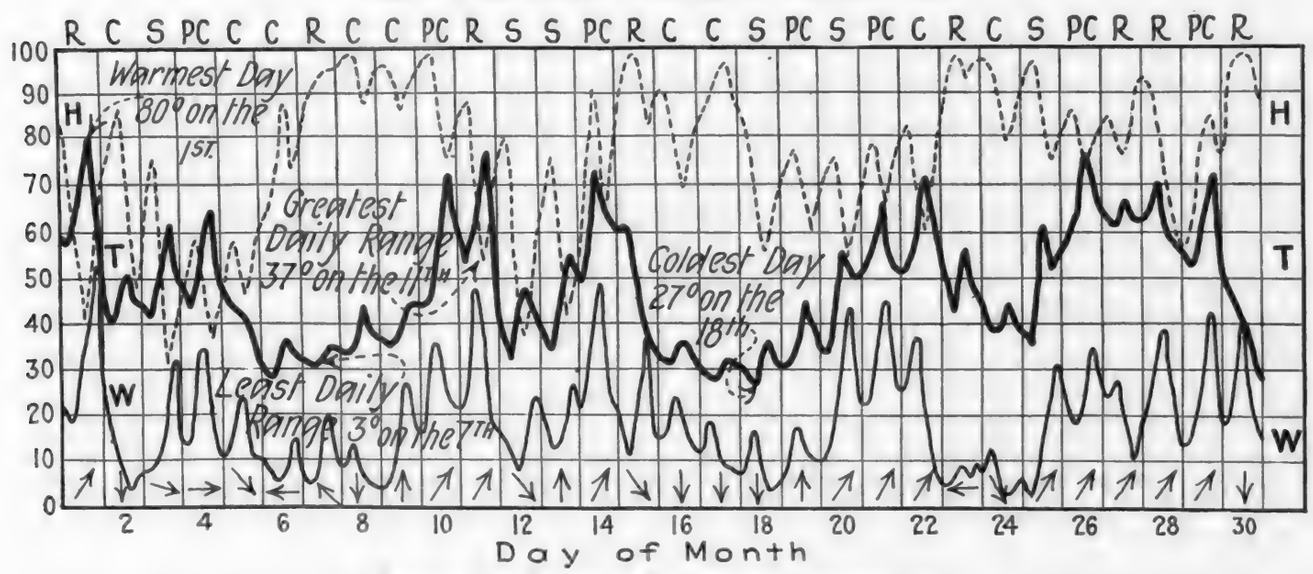
Day of Month

Record of the Weather in Chicago for November, 1927


R C S PC C C R C C PC R S S PC R C C S PC S PC C R C S PC R R PC R
Warmest Day 80° on the 1st.
Greatest Daily Range 37° on the 11th
Coldest Day 27° on the 18th
Least Daily Range 3° on the 7th
H
T
W
Day of Month

Record of the Weather in St. Louis for November, 1927

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE by the United States Weather Bureau.
Heavy lines indicate temperatures in degree F. Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings at 8 A.M., 12 M., and 8 P.M.
S—Clear, PC—partly cloudy, C—cloudy, R—rain, Sn—snow. Arrows fly with prevailing directions of wind.

Monthly Heating Loads in Degree-Days In Five Typical Cities

THESE charts show graphically the heating load in New York, Boston, Pittsburgh, Chicago and St. Louis. The integration of each monthly curve is given in degree-days; also the total heating load for the current heating season, to date.

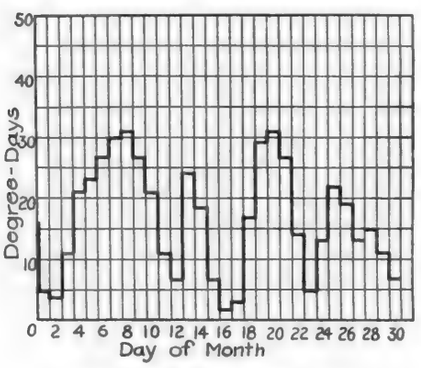
Last month's issue contained the first charts in the series. They are so drawn that the continuous heating load for any city can be built-up by cutting out the several charts and pasting them along a pencilled base line. The story of this method of measuring the heating load, and some of the many applications, will be found in THE HEATING AND VENTILATING MAGAZINE for September and November, 1925.

The "degree-day" is a unit developed by the American Gas Association and represents the *product of one degree of temperature, and a time factor of one day.* Through a study of actual conditions, the American Gas Association determined that the minimum temperature of bodily comfort in the home is reached when the mean daily temperature falls below 65° F. It must be borne in mind that, with a daily *mean* temperature of 65° F., the day-time temperature will average around 70° F., and the only time room temperatures would be below the comfort point would be around midnight. This explains the derivation of this arbitrary figure.

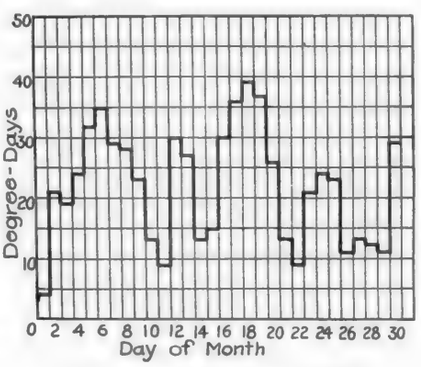
Manifestly, for each locality there may be determined the number of days of the year for which the average temperature is below 65° F. This period may be called the heating season.

If, then, we have a mean daily temperature of 60° F., it is evident that, for this day, we can measure the heat requirements by the figure "5 degree-days," whereas, had the mean temperature been 55° F., the heat requirement would be measured by "10 degree-days," or would be twice as great.

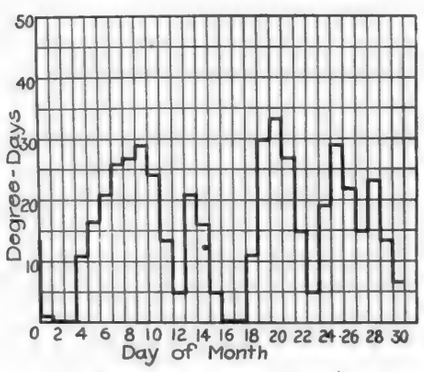
Summing up, therefore, for a week, or a month, or a heating season, we may express the aggregated heating load of any locality in units that permit comparison with that of any other point. Likewise, we may compare the heating requirements at any given place, during one heating season, with those of any other heating season. And so a "mild winter" or a "hard winter" becomes definable in accurate units that may be translated into B.T.U. Basing these units on the very accurate data of the weather bureau over a period of fifty years, a high degree of accuracy results.



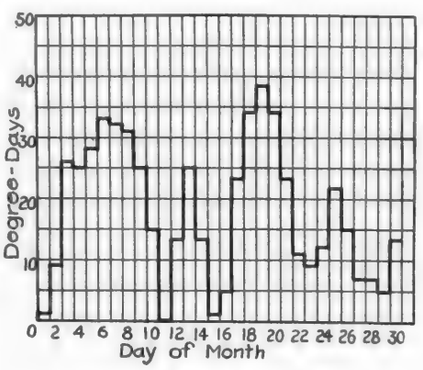
New York, November, 1927
Degree-Days 494—Degree-Days to Date 724



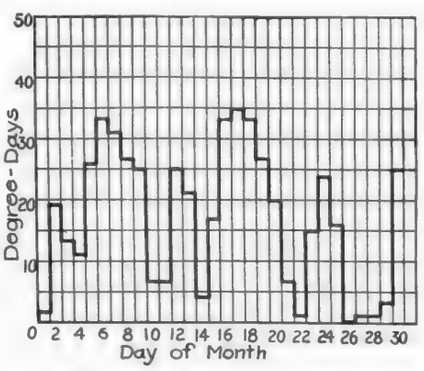
Chicago, November, 1927
Degree-Days 655—Degree-Days to Date 891



Boston, November, 1927
Degree-Days 466—Degree-Days to Date 722



Pittsburgh, November, 1927
Degree-Days 535—Degree-Days to Date 806



St. Louis, November, 1927
Degree-Days 479—Degree-Days to Date 621

Iso-Degree-Day Chart and Iso-Fuel-Consumption Charts

Degree-days have been determined for more than 300 cities, based on recorded temperature observations covering from 20 to 50 years. Marking the heating loads of these cities on a map of the United States, it was possible to draw lines of equal heating load extending across the country. Such curves have been designated "Iso-Degree-Day" lines.

Having established actual heating loads that could be translated into B.T.U. per season, the curves have been applied to determining the gas, oil or coal consumption on a degree-day basis. The entire series of charts, with an explanatory statement, are published by THE HEATING AND VENTILATING MAGAZINE.

Heating and Piping Contractors National Association

H. & P. C. A. Secretaries Take Stand on Important Trade Questions

MUNICIPAL permits for the installation of heating apparatus, variations in existing smoke ordinances, quantity surveys and the effect of the time-payment plan on chattel mortgages in connection with replacement work, were some of the important subjects discussed and acted upon at the recent meeting of secretaries of affiliated local associations, at a two-day conference held December 6-7, 1927, at the headquarters of the Heating and Piping Contractors National Association, in New York. Louis T. Braun, secretary of the Chicago association, acted as chairman, and A. R. Herske, manager of the Cleveland association, acted as secretary of the conference. The national association was represented by Joseph C. Fitts, of the headquarters staff.

William C. Bergner, secretary of the National Trade Extension Bureau, who was one of the speakers, gave an outline of the bureau's objectives for 1928, and urged a full attendance at the Presidents' and Secretaries' Conference of the Trade Extension Bureau, in Pittsburgh, January 9-11, 1928. A feature of the conference was a joint meeting of the secretaries and the national board of directors.

Among the resolutions adopted were the following:

Resolved, that the board of directors be advised that the mature consideration of the secretaries assembled here is of the opinion that municipal permits for the installation of heating apparatus is economically unsound, and should be opposed in all cases.

Resolved, that the variations existing in the smoke ordinances of a number of cities where local associations of heating contractors exist are such as to merit the attention of the national association in collecting technical information for the guidance of existing and new locals in the revision of existing and proposed new smoke ordinances.

Resolved, that the national organization obtain as much information as possible in connection with quantity survey, and have such information available for distribution in the near future, it being the consensus of opinion of the secretaries that quantity survey in connection with certified heating might prove of value.

Resolved, that the national association investigate thoroughly the chattel mortgage statutes, for the purpose of aiding the locals.

Resolved, that the attention of the board of directors be called to the fact that the ever-increasing tendency towards tapping the marketing of replacements of old-time equipment will demand additional information with reference to chattel mortgages, owing to the fact that this type of work will be conducted almost wholly under the partial-payment plan.

Other subjects which were on the program, but which had to be deferred to another meeting for lack of time, were the apprenticeship plan, licensing of journeymen, steamfitters and heating contractors, discouragement of certified plumbing, State legislation for separation of mechanical trades, establishment of a credit bureau, certified heating and uniform chimney ordinance.

Business Prospects for 1928

In a Christmas message to the industry, Secretary Henry B. Gombers, of The Heating and Piping Contractors National Association, quotes the declaration made a year ago by the American Federation of Labor, in favor of a five-day work week. At that time Mr. Gombers made the comment: "Is this for the purpose of taking up the slack that will result from a lessening of the wonderful prosperity our people have been blessed with?"

In commenting upon the situation at the present time, he states, "Part of it has at least, in that there has been an easing up in building when we take into consideration the necessity of an increase in building operations each year in order to keep pace with increased population and other basic facts."

Referring directly to the prospects for 1928, he says, "The supply of steamfitting mechanics in a large majority of the cities from which we obtained reports in November was plentiful, which condition is unusual at that time of year. This must change very soon if we are to have even as much business in 1928 as was in evidence in 1927.

"One journalist surveying the opinions of some of the nation's leading bankers, economists and industrial leaders has stated that they are in general agreement that 1928 will be a prosperous year. They regard business conditions generally throughout the country as sound and favorable, even though there has been a recession in activity in some important lines during recent months.

"One factor that prompts me to predict a better outlook for employers in our industry is the readiness on the part of unions to renew present agreements for a further term of one, two and three years with wages remaining at existing rates.

"It is obvious that some of their leaders read the signs of the times and realize that steadiness of employment at current wages is very much to be desired by their constituents."

New York Heating Contractors Adopt Seal

The Heating and Piping Contractors New York City Association has adopted a form of seal for those who are grouped as members of the association, as the official hallmark of heating and ventilating contractors and contractors for sprinkler work and refrigeration. This seal will appear upon all communications from its membership, and any one employing a contractor using the seal, immediately knows that, in addition to financial responsibility revealed by regular trade channels of information, this contractor offers the services of his organization connections for the benefit of his customer.

PROMOTION · PROTECTION · AND · PEACE · IN · THE · BUILDING · INDUSTRY
BUILDING TRADES EMPLOYERS ASSOCIATION
MEMBER
HEATING AND PIPING CONTRACTORS ASSOCIATION
NEW YORK CITY

Membership Insignia of the Heating and Piping Contractors New York City Association

Eight Local Heating Contractors' Associations Licensed to Engage in Certified Heating

Eight local associations of the Heating and Piping Contractors National Association have been licensed to engage in certified heating, according to a report of the Committee on Certified Heating, presented at the meeting of the association's board of directors, in New York, December 5-6. The associations so licensed are Chicago, Cincinnati, Cleveland, Newark, Norfolk, Philadelphia, Portland, Ore., and Sheboygan, Wis. The committee also reported that the direct-mail campaign, as planned for those cities having certified heating, is now an assured success, nine cities cooperating in the project, including Cincinnati, Cleveland, Milwaukee, Newark, N. J., Norfolk, Va., Sheboygan, Wis., and Washington, D. C. In Milwaukee, Norfolk, and Sheboygan, the certified heating program is not yet in operation, but the associations in those cities are having this advertising material prepared for use when the service is instituted.

At the same meeting the Committee on Standardization reported the completion of the pipe-size data on one-pipe and two-pipe gravity, vapor and vacuum steam systems, in conjunction with a committee of the American Society of Heating and Ventilating Engineers, and that both organizations hereafter would publish identical data on pipe sizes.

Wages and Conditions in Steamfitting Industry

A survey of the steamfitting industry in 181 cities, recently completed by the Heating and Piping Contractors National Association, shows labor conditions still stable, with a slight tendency for the wage rate to rise in some of the cities paying a lower rate than others nearby. Nineteen cities showed increases in wages over the May 1, 1927, rate, and eight cities showed decreases.

Pine Bluff, Ark., reports the low rate of the survey, namely, 60 cents per hour, while the East Side Association (East St. Louis and neighboring towns) has the high rate of $1.75 per hour. The median rate is $1.25 per hour and the average rate is $1.2212 per hour. Forty-nine cities are paying the $1.25 rate.

In view of the present agitation for a five-day week, special interest attaches to the number of hours worked per week. Nine cities reported a nine-hour day. Twelve cities work only five days a week. In other cities the 44-hour week prevails. Eleven cities provide for a regular night shift at a single time.

An important index of the amount of work actually done is the supply of men. The survey shows 102 cities reporting men plentiful, 54 cities reporting the supply of journeymen equal to the demand, and only 17 cities reporting men scarce.

American Oil Burner Association

An informal tie-up with the National Electric Light Association Merchandising Committee has resulted in the appointment, by that organization, of a sub-committee of which Frank Coupal, of Buffalo, is chairman, to act jointly with a committee of the Oil Heating Institute in the guidance of both the oil burner and the power industries in their approach to the house-heating market. M. E. Simpson, representing the Oil Burner Institute on this committee, reports that his contact will be one of great value to the oil burning industry.

Is Gas a Real Competitor of Oil?

The following, taken from a recent bulletin of the American Oil Burner Association, is an interesting index, both of development and of opinion, in regard to the relative importance of oil and gas as domestic fuel.

"In the *Gas Age Record* of November 19, there is an interesting story on the selling of 250 Doherty gas-oil burners in seven weeks. This was in Kansas City. Quoting from the article they state that this campaign is an outstanding accomplishment and that it was conducted under many handicaps. When the quotas were assigned to the two companies, the Doherty gas-oil burner was an appliance that was new to the salesmen and involved individual educational work so that the men could talk the merits of the burner intelligently to the customers. No advertising was used as a sales aid and the major portion of the burners was sold in the hottest part of the season with the temperature hovering around 92° most of the time. All obstacles were met; the 250 burners are sold and will be in use at the start of the heating season. If a gas company can sell oil burners in Kansas City, which has available natural gas, it would not seem that gas is a serious competitor. This is brought out even more forcefully in a summary of the seven weeks campaign. Gas-oil burners sold 250, gas-fired furnaces 7, and conversion jobs 91. This makes a total of 98 gas-fired installations, including conversions, as compared with 250 burners that were sold. The following quotation from an editorial in *Power*, November 1, well defines the status of gas as a fuel. 'Although increased efficiency and economy of heat may be obtained by its use, the present cost of gas, except in certain sections, is too high to justify it as a fuel. There is no indication under present manufacturing processes that the cost of gas to the consumer can be reduced sufficiently to make it compete with oil and coal.' "

Petroleum Interests Stand Behind Oil-Burner Industry

At a meeting of the Board of Directors of the American Petroleum Institute, held in Chicago, December 6, at the time of the annual meeting of the institute, a resolution was adopted to the effect that the board of directors of the A.P.I. have full faith in the ability of the oil industry to meet the growing demand for oil for domestic heating purposes. At this time, the board also appointed a committee of three members to co-operate with the Oil Heating Institute in disseminating to homeowners accurate facts about the advantages and superiority of oil heat.

T. E. B.'s Enlarged Program

Details of the enlarged program arranged by the National Trade Extension Bureau for the plumbing and heating industry in 1928 indicate that the bureau will operate through civic bodies, trade associations, building associations and women's clubs, in addition to the usual trade channels. As is well known, the bureau is organized to collect and spread heating and plumbing knowledge through market analyses and sales surveys, field service and the publication of a monthly service bulletin. In addition, the bureau gives advertising and sales help to both industries, gives accounting service through the distribution of bookkeeping systems, and maintains home-study courses for journeymen, foremen and apprentices.

In a publication outlining the enlarged program, the bureau lists its activities in detail and the publication includes a list of bureau members as of October 1.

Directory of Sheet Products and Manufacturers

Under the title "5,000 Sheet Steel Products and Who Make Them," the Sheet Steel Trade Extension Committee, Pittsburgh, has issued a unique and comprehensive directory, presented in 8½ in. x 11 in. pages, bound in blue cloth with silvered paper in imitation of a sheet of planished steel. This directory should supply a long-felt demand for data of this phase of the steel industry. Following a brief history of iron and steel, in which present-day methods of manufacture are outlined, a section is devoted to details of U. S. standard weights and gauges for iron and steel sheets, and a list of the simplified types recommended by the U. S. Department of Commerce. There follows an index of the manufacturers of steel products and then an alphabetical list of fabricators and a geographical list of fabricators. Nearly 300 pages are devoted to a classified index of products with the names of manufacturers of each, and the volume is completed with an elaborate index of fabricators, the whole forming a complete cross-indexed volume of reference. There are 445 pages, and a copy can be obtained from the Sheet Steel Trade Extension Committee, Oliver Bldg., Pittsburgh, at $3 per copy, which obviously does not cover the cost of production.

Canadian Oil Burner Association Formed

Following several months of discussion, the Canadian Oil Burner Association was launched at a meeting held at the offices of Fess Oil Burners of Canada, Ltd., Toronto, December 14, 1927. Nearly a score of manufacturers and dealers participated in the meeting, at which Leod D. Becker, managing director of the American Oil Burner Association, outlined the benefits of such an organization and explained its functioning.

Organization was perfected through the election of Lionel L. Jacobs as president, A. C. Mackenzie, editor of *Sanitary Engineer*, secretary, and E. D. Ranck, Coleman Lamp Company, Limited, Harry Adams, Adams Oil Burner Company, and J. H. Woolson, Johnson Super Fuel Oil Burner Company, as a committee to draw up a constitution and by-laws.

Close co-operation is anticipated between this organization and the American Oil Burner Association, as Lionel L. Jacobs is president of both.

A membership committee was elected, consisting of W. E. Clark, H. H. Gies, E. C. Coleman and R. Beausoleil.

American Society of Heating and Ventilating Engineers

High Spots on Program of Annual Meeting

HERE are the principal papers and committee reports to be presented at the forthcoming annual meeting of the American Society of Heating and Ventilating Engineers, at the Hotel Pennsylvania, New York, January 23-26:

MONDAY AFTERNOON, JANUARY 23

Greetings by President F. Paul Anderson.
Testing of Boilers and Radiators—Dr. C. W. Brabbée.
Test Methods for Radiators, F. C. Houghten and S. R. Lewis.

MONDAY EVENING, JANUARY 23

Co-ordinated Research Session.
Addresses:
S. R. Lewis, chairman, A.S.H.V.E. Committee on Research.
Dr. F. W. Stratton, president, Massachusetts Institute of Technology.
H. Leigh Whitelaw, American Gas Association.

TUESDAY MORNING, JANUARY 24

Report of committee on research—S. R. Lewis, chairman.
Report of director of Research Laboratory—F. C. Houghten.
Code for Testing Air Cleaning Devices—Prof. F. B. Rowley.
Practical Ventilation for Schoolrooms—S. R. Lewis.
Effects of Ventilation in the Health of School Children—T. J. Duffield.
First Principles in Unit Ventilation—W. R. McCornack.

TUESDAY AFTERNOON, JANUARY 24

Report of committee on increase of membership—C. V. Haynes.
Report of secretary—A. V. Hutchinson.
Report of committee on heating and ventilating garages—O. N. Walther.
What Will the Engineer Choose—Heating Only or Air Conditioning for the Modern Plant?—H. P. Gant.
Aeration of Industrial Buildings—W. C. Randall.
Natural Ventilation of Farm Buildings—Prof. F. L. Fairbanks.
Report of the finance committee—Thornton Lewis.

WEDNESDAY MORNING, JANUARY 25

Some Studies of Corrosion in Return Lines of Steam Heating Systems—F. N. Speller.
Code for Rating Low-Pressure Heating Boilers—Alfred Kellogg.
Relationship between Output and Operating Characteristics in Tests of Low-Pressure Steam Heating Boilers—P. Nicholls.
Some Studies Relative to the Rating of Low-Pressure Boilers—Prof. L. O'Bannon.

WEDNESDAY AFTERNOON, JANUARY 25

Standard Test Code for Heat Transmission through Walls—A. P. Kratz.
Utility Requirements for Hospital Buildings—Prof. G. L. Larson.
Value of Building Insulation to Reduce Heat Losses—E. N. Sanbern.
Economic Thickness of Insulation for Building Walls—M. S. Wunderlich.
Extended Surface Radiation—Charles S. Sage.

THURSDAY MORNING, JANUARY 26

Report of the Guide publication committee—Perry West.
Practical Results of Ventilating the Holland Tunnel—Ole Singstad.
Saving Heat in Skyscrapers—F. C. Houghten and M. E. O'Connell.

THURSDAY AFTERNOON, JANUARY 26

2:30 Inspection of Holland Tunnel.
3:00 Inspection of Brabbée Laboratory.

The annual dinner and dance will take place Tuesday evening, January 24. H. Berkley Hedges heads the committee on arrangements. The sub-committee chairmen are: Russell Donnelly, hotels; Alfred Engle, entertainment; C. W. Stewart, ladies; W. J. Osborn, publicity; G. A. Dornheim, finance; R. A. Wolff, ex-officio.

Summer Meeting for West Baden

It was decided at the meeting of the council of the society at the "open house" at Pittsburgh, November 7, to hold the 1928 summer meeting at West Baden Springs, Ind., in June.

Open House at Laboratory and Meeting of Council

The Research Laboratory held open house at the U. S. Bureau of Mines Experiment Station, Pittsburgh, November 7, and the council of the society met at the same time. President Dean F. Paul Anderson presided and the program for the forthcoming annual meeting was discussed. It was decided to have a session devoted to the work of co-ordinating research which will endeavor to eliminate duplication of work of this kind and a central agency was provided for recording all existing facts which have been developed on heating and ventilating subjects through research investigations.

In connection with the joint work of committees from the Heating and Piping Contractors National Association and the A.S.H. & V.E. Guide Committee, resulting in the production of standard tables for pipe sizes for steam heating systems, it was decided that these tables being held under joint copyright might be reprinted only under certain specified conditions to be agreed to by the two organizations.

A. S. H. & V. E. Guide for 1928

With 100 pages of additional data and a greatly-enlarged manufacturers' catalog data section, the A.S.H. & V.E. *Guide* for 1928 is an impressive volume. It is evident that every effort has been made to furnish a complete working manual covering every phase of heating and ventilation and, for this reason, much of the material appearing in earlier editions has been republished in revised form. The chapter on "Calculating the Heat Losses From Buildings," prepared by Prof. A. C. Willard, includes not only additional figures on the internal conductivities of building materials and insulations, but embraces some 23 tables of coefficients of transmission for practically every type of building construction. These coefficients are calculated from the data given in the internal conductivities tables. A note attached to each table calls attention to the fact that the coefficients are based on an outside windage of 15 miles per hour, which, it will be recalled, is the point of divergence from the Heating and Piping Contractors National Association's method for estimating radiation.

Easily the most important, or at least the most timely, data contained in the new *Guide* are the pipe-size tables, based on the A.S.H. & V.E. Research Laboratory experiments, which have been accepted as standard, both by the A.S.H. & V.E. and the H. & P.C.N.A. Supplementing the tables published in the Research Laboratory's report, a number of additional tables have been worked out for gravity, vapor and vacuum-pump systems, both one and two-pipe, where the equivalent length of run from boiler or source of supply to the farthest radiator exceeds 200 ft.

Prof. F. E. Giesecke contributes the chapter on water-heating systems, using the data which formed his series of

articles on this subject published in THE HEATING AND VENTILATING MAGAZINE during 1925-26. Industrial oil heating is covered by Byron K. Eaton, and domestic oil heating by H. F. Tapp, technologist of the American Oil Burner Association.

In the chapter devoted to heating with gas, compiled by W. E. Stark, the degree-day method of figuring heating loads is explained in detail. As this method is applicable to the entire house-heating field and has so many obvious advantages, it would seem well worth while to adopt it as standard practice.

In view of the open-window agitation, it is refreshing to note the sane manner in which this subject is covered by such authorities as John Howatt, E. P. Heckel, W. A. Rowe and Samuel R. Lewis. As was to be expected, adequate consideration has been given to the items of air temperature, relative humidity, air motion, air cleanliness, air distribution, freedom from odors and freedom from injurious substances, in contrast to the formula of the window-ventilation advocates. A revised form of the Synthetic Air Chart is included, containing an "effective temperature" difference column. Window ventilation, however, with gravity exhaust is given a place this year as one of the recognized systems of ventilation.

Air cleaners are adequately covered, including those of the viscous type. Other chapters deal with effective temperature, motor power for fans, air-duct design and construction, conditioning and cooling air, ozone ventilation, methods of drying, dust exhaust and collecting systems, mechanical draft, and ventilators and natural ventilation. No less than 283 pages are devoted to data on manufacturing products. As in previous years, the *Guide* includes a complete roll of the society's members. Size 6-in. x 9-in. Pp. 680, and a 56-page insert. Cloth, $4. May be had from the society or through the book department of THE HEATING AND VENTILATING MAGAZINE.

H. P. Gant Addresses Philadelphia Chapter

"What Will the Engineer Choose? Heating Only, or Air Conditioning for the Modern Plant?" was the subject for discussion at the November meeting of the Philadelphia Chapter where 105 members were present. This talk was given by H. P. Gant of the York Heating and Ventilating Corp., Philadelphia.

In his presentation Mr. Gant cited a manufacturing plant for which estimates were made for the heating and ventilating, using direct radiation, suspended-type unit heaters, floor-type unit heaters, spray-head humidifiers and direct radiation, central air-conditioning system and self-contained air-conditioning units. He explained the application of the six systems and stated that the figures given were supplied by R. C. Bolsinger, Thornton Lewis, A. F. Carlson, E. T. Murphy and R. K. Taliaferro. Harry G. Black made the cost estimates and Walter H. Wild designed the boiler plant. Comparisons were made of the costs of heating alone, also heating and humidifying of the various plants designed. A discussion followed of the various factors which the engineer must weigh carefully before advising his client to install a specific system.

At a brief business meeting, President Jones stated that the plan of limited membership was to be tried by the chapter as provided for by the council of the society, and that Edward G. MacAllister had the honor of being the first member entered under this new plan.

Joint Meeting of Buffalo Chapter and Engineering Society of Buffalo

A joint meeting of the Buffalo Chapter with the Engineering Society of Buffalo was held at the Hotel Statler, December 13. F. H. Morehead, chief engineer of the Walworth Company, was the principal speaker and his talk, which was illustrated with stereopticon slides, was on the subject of the present status of the various standards now being developed for valves and fittings for high temperatures and for high pressure steam service.

New Officers of Pittsburgh Chapter

F. A. Gunther was elected president of the Pittsburgh Chapter at its annual meeting held in the Bureau of Mines Building, Pittsburgh, December 12. Other officers elected at this meeting are: Vice-president, F. C. McIntosh; treasurer, Peter O'Neill; secretary, C. F. G. Zobel; directors, M. M. Timmerman, R. B. Heilman and Thomas M. Dugan. The speaker of the evening was Fletcher Collins, of the A. M. Byers Company, whose subject was "Iron Pipe in the Heating Industry."

At the November meeting of the Pittsburgh Chapter 50 members were present and T. M. Dugan presided over the business session.

F. C. Houghten, director of the Research Laboratory, then took the chair, and introduced as the first speaker, Dean F. Paul Anderson, president of the society, who emphasized particularly the society's stimulation of research.

S. R. Lewis, chairman of the Research Committee, detailed his activities as chairman of that committee.

J. I. Lyle, chairman of the Research Laboratory at the time it was first organized, and Thornton Lewis, chairman a few years later, gave talks on the inception, growth and usefulness of the Research Laboratory.

C. V. Haynes, appealed to members to help increase the national membership.

W. H. Carrier gave a short talk on the relation between the American Society of Heating and Ventilating Engineers and the American Society of Refrigerating Engineers, of which latter organization he is now president.

Wisconsin Chapter Elects Officers

At the October meeting of the Wisconsin Chapter, held at the Hotel Martin, October 24, the following new officers were installed: President, Prof. G. L. Larson; vice-president, W. F. Noll; secretary, V. A. Berghoefer; treasurer, Martin Erickson. Board of governors: R. G. Olson, H. M. Miller and Paul G. Downey.

After the election, a report of the First National Fuels Meeting, held in St. Louis, was given by Martin Erickson.

New York Chapter Members Inspect Subway Construction

Members of the New York Chapter took advantage, December 19, of the invitation of the Board of Transportation of the City of New York, to inspect the subway construction work in the vicinity of Columbus Circle.

Col. J. R. Slattery, deputy chief engineer, personally conducted the party of twenty-five through typical sections of the underground works, both where the construction was completed and where the drilling, blasting and rock removal were in full swing. At the conclusion of the inspection trip the party repaired to the Building Trades Club, where, after dinner, Colonel Slattery spoke on the subject of subway construction.

Welding Subject of New York Chapter Meeting

At the November meeting of the New York Chapter, held at the Building Trades Club, November 21, the subject of welding occupied a prominent place. G. E. Harcke, industrial engineer of the Air Reduction Sales Co., New York, was the principal speaker.

Mr. Harcke addressed the meeting by outlining the history and development of welding and cutting from the days of the blacksmith's forge to the present practice of using acetylene and oxygen, which in a combined form produce intense heat. With J. F. Callahan assisting, also of the Air Reduction Sales Company staff, Mr. Harcke performed a series of experiments with liquid oxygen, freezing various articles, ranging from eggs to cut flowers, and showed the action of the intense cold on these articles. This was followed by a four-reel motion picture, made under the supervision of his company and the United States Bureau of Mines, showing many examples of welding and cutting. Booklets were distributed by Mr. Harcke on "Pipe Line Welding from the Oxy-Acetylene Viewpoint."

Michigan Chapter Discusses Future of Cooling Systems

Two past-presidents of the society, J. R. McColl, who was in office during 1922-23, and Walter S. Timmis, president during 1919-20, were the principal speakers at the December meeting of the Michigan Chapter, held at the Imperial Hotel, Detroit, December 12. Both spoke on the future of air cooling systems. Sixty members and guests were present.

Mr. Swan, of the American Radiator Company, gave a talk, illustrated with slides, on the Mercoid switch. He was followed by Cecil Farrar, president of the Excelso Heater Corporation, who renewed his appeal for the sale of heating apparatus on the basis of living comfort, rather than on price.

President Calvert was named to represent the chapter on the A.S.H. & V.E. nominating committee, with J. R. McColl as alternate.

Chicago Executive Addresses Illinois Chapter

More than a hundred members and guests at the November meeting listened to John J. Aeberly, chief of the Division of Ventilation, Department of Health of the City of Chicago, on the pertinent subject, "How Can We Co-ordinate the Viewpoint of the Health Department With the Viewpoint of the Heating and Ventilating Engineer?"

In the introduction to his talk Mr. Aeberly stated that, within the city limits of Chicago, there are ventilating systems aggregating a capacity of 80,000,000 cu. ft. per minute, and if all of these systems were operated at one time, it would provide sufficient capacity for 3,000,000 people.

"No division of ventilation or public office assigned to the regulation of ventilation can justify its existence unless, in all the activities of such office, the health of the public is considered of primary importance as it relates to preventive medicine," said Mr. Aeberly.

He then outlined the functioning of the legislative and administrative branches of the city government relating to his department and told of the long struggle, in 1910, to compile a ventilation code that would satisfy the public demand for improvement of their conditions and, at the same time, avoid the placement of prohibitive costs on building construction. He told of the operation of this code and of the frequent necessity for revision consistent with the advancement of engineering practice. "Since 1912," he said, "the division of ventilation in the department of health has enforced such ordinances as have been in effect, at all times endeavoring to inject common sense into the many particular problems that had to be solved."

"The viewpoint of the Division of Ventilation of the Department of Health," said Mr. Aeberly, "is a conglomerate viewpoint of the ventilation engineer, the public health worker, the owners of buildings, both large and small, frequenters of buildings, such as the general public, the manufacturing industries, the owners of the theaters, etc. When such a viewpoint is held, it is rare that all of the groups are entirely satisfied."

At the conclusion of Mr. Aeberly's address, he expressed his willingness to answer questions and an interesting discussion followed, participated in by President Heckel, Dr. E. V. Hill, R. V. Haywood, and others.

Secretary Thomas announced that the February meeting of the Illinois Chapter would have as its guest speaker Prof. A. C. Willard, who at that time will be president of the A.S.H. & V.E.

The Spirit of the A. S. H. & V. E.

Under this title there is being sent out to members of the society a spirited story of the founding and growth of this national organization. There is presented a list of accomplishments of the society, particularly in regard to codes and the development of highly-specialized equipment, such as the Nicholls heat meter, and the Anderson-Armspach dust determinator. There follows a very readable story of the activities in the Research Laboratory. In conclusion, there is a chapter on membership in the A.S.H. & V.E., with excerpts from the constitution covering this feature. It would be difficult for anyone interested in this field of endeavor to read this brochure without feeling the urge to become identified with the society.

Electric Heating in Seattle

In the annual report of the Department of Lighting of the City of Seattle, Washington, are some interesting data in regard to the use of electricity for heating in this far western city. The following comment presents the high spots of the situation:

"The past two years the city has furnished service to a number of small apartment houses constructed to accommodate from four to ten families. With each apartment on its own meter, covering lighting, cooking, heating and hot water service, each family is as independent as it would be in a private residence. The managements, on the other hand, need supply no janitor service. This in turn is reflected in the rent and should help to off-set the cost of heating. Only the space actually in use is kept warm instead of heating the entire building, as is done in the standard central heating system. Where electric heating is installed, each one may set his own standard of temperatures without being bound by the ideas of some one in the boiler room or the limitations of the local heating ordinances.

"A number of advantages present themselves during the period of design and construction, such as:

A lower first cost of the heating plant.

Heat definitely proportioned to the various rooms.

No chimney, boiler room, or fuel storage required.

Basement excavation often omitted.

"Any saving that will help to reduce a proportionately high operating cost per apartment is especially desirable in small structures such as 'bungalow courts.'

"However, the apartment house operator who would install electric heating and use it as a talking point to rent his space must use judgment in selecting tenants who are able to afford such conveniences. If he does not make the proper adjustment in the new distribution of costs and passes the brunt of the difference on to the occupant, there may result an abnormally large turnover of tenants as well as long periods of vacancy. False assumptions or statements are sure to provide bad advertising and prove to be costly.

"The average three-room apartment will use from $12 to $25 worth of current per month for light, cooking, heating and water heating, depending on the season, the construction of the building and the care used to save current. The average monthly bill for the year will be between $14 and $18.

"Regardless of the fact that apartment arrangement gives the minimum of exposed wall surface, electric heating should not be considered in connection with shoddy building construction. All outside walls should be heavily insulated, windows and doors fitted with a good grade of flashing and floors laid on good thick paper. Ceilings where exposed to low temperatures should be double constructed by covering the top of the joists. All hot water piping and tanks should be well lagged with a good grade of insulating material.

"It is false economy to pay a comparatively high price for a 'superior service' and then waste a large portion of it in places where it is not needed.

"The entire load for lighting, cooking, water heating and air heating is placed on one meter (except where water heater is on flat rate) and billed at residence rate—first 40 K.W.H. at 5½ c, next 200 at 2 c, and all over 240 at 1 c."

It might be added that Seattle owns the electric light and water system and is developing 840,000 hydraulic H.P. on the Skagit River to be used to furnish light and power to its citizens, to serve homes and to build up industries in the city. It is interesting to note that after the first $6.20 worth of electricity used for house heating, the rate is but 1 c per K.W.H.

Editor's Note: Although the normal heating load in Seattle is 5156 degree-days, as compared with 5303 for New York and 6007 for Chicago, the season is so nearly 12 months in length that the daily load is not so high. Computing the electrical energy required for the equivalent of 100 sq. ft. of steam radiation for a heating season, it develops that 14,300 K.W.H. in 10 months or 1,430 K.W.H. per month will supply this heat. (It must be remembered that the heating efficiency is 100%). This would cost $18.10 and, assuming manufactured gas at $0.70, would be about twice as much as gas would cost for equivalent heating.

Year Book of the National District Heating Association

The annual publication of the National District Heating Association containing the official proceedings of the eighteenth annual convention, held at West Baden, Ind., last May, is being distributed to members. In addition to the papers presented at the annual meeting of the association, there are reports of the various committees and subcommittees. The volume contains 452 pages and is well indexed.

Insulation Manufacturers and the A. S. H. & V. E. Insulation Code

Further information received regarding the reported adoption by the insulation manufacturers of the A.S.H. & V.E. Code for Testing Materials is to the effect that the code, as revised, has been accepted on behalf of some 20 manufacturers of insulating materials by a committee of seven which met with an advisory committee of the National Better Business Survey, in Chicago, last September. There is no formal organization as yet of a National Association of Insulation Manufacturers.

Disc Fan Provides Exhaust Ventilation for Large Laundry

Until recently it has generally been understood that static pressure could not be produced by disc fans. The notable discoveries made in aerodynamics during the last 20 years have had an important bearing on fan design, so that it is now possible to produce disc fans to furnish static pressure with satisfactory efficiency.

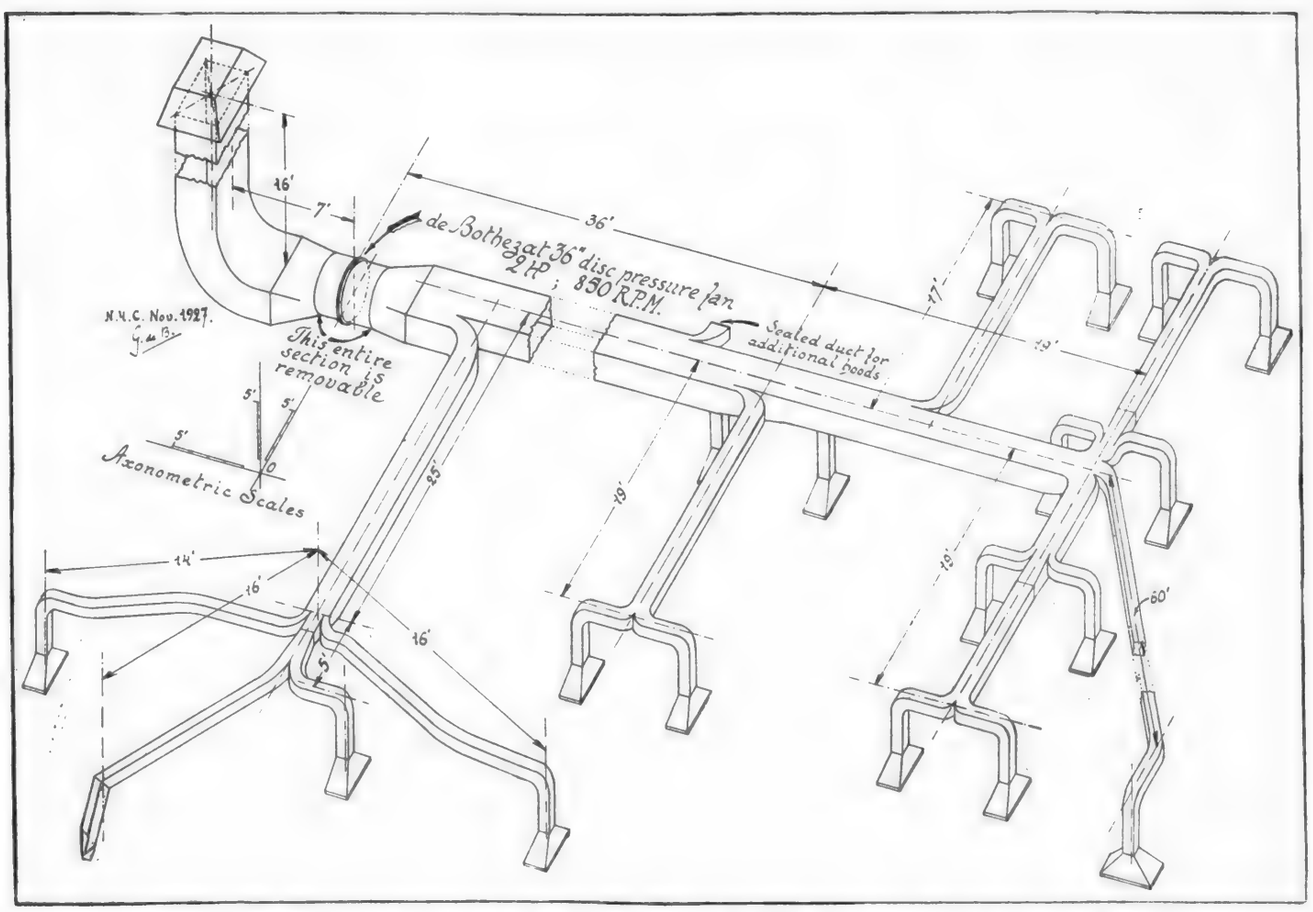
A striking example of what can be accomplished with disc pressure fans in exhausting air from buildings is shown in the accompanying views of an exhaust ventilation system in the Lackawanna Laundry, on Summit Avenue, Jersey City, N. J. This laundry has approximate dimensions of 200 ft. x 200 ft. x 20 ft. Altogether there are 380 ft. of ducts, with 51 bends, connecting 19 hoods to a single disc pressure fan. Provision is made for the addition of more hoods later, and, in that event, the same outfit will be used, as the motor is not yet loaded to capacity.

Each hood is designed to exhaust the heated air or vapors from two presses or other laundry machines. For the entire system a single 36-in. De Bothezat disc pressure fan, manufactured by the De Bothezat Impeller Co., New York, secures the exhaust of about 475 C.F.M.

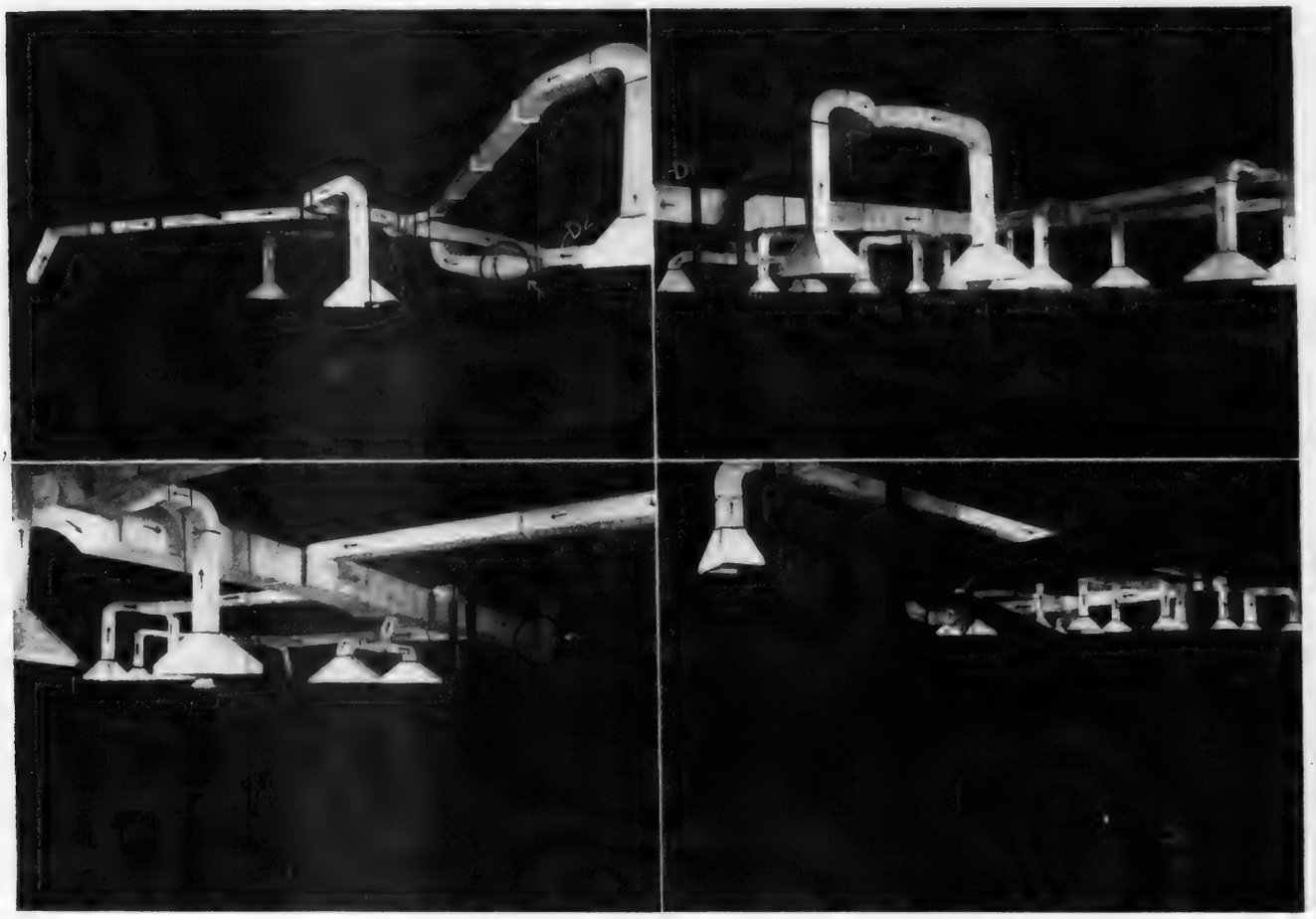
Detail of Exhaust System in Lackawanna Laundry Showing Manner in Which De Bothezat Disc Pressure Fan Is Installed in Duct

through every hood. The fan is operated by a 2-H.P. motor at 850 R.P.M. According to the engineer in charge of this installation, the equipment has given highly-satisfactory performance.

Special interest attaches to the simplicity of the installation. The fan itself, it will be noted, is placed in an enlarged section of the duct where it is completely concealed. If at any time it is desired to remove the fan, the section of the duct in which it is placed can be unbolted and lowered without disturbing the rest of the duct.



Axonometric Diagram of Exhaust Duct Installation with 36-in. De Bothezat Disc Pressure Fan in Lackawanna Laundry, Jersey City, N. J.



Exhaust Duct System in Lackawanna Laundry, Jersey City, N. J., Handled By Single 36-in. De Bothezat Disc Pressure Fan
The location of the fan is indicated by the circles. The arrows indicate the direction of the air flow. In the left top picture, duct D2 constitutes the continuation of duct D1 of the right top picture.

Code of Ethics for Salesmen

UNDER the motto of "Live and Let Live," the Heating and Ventilating Salesmen's Club, of Los Angeles, has drafted the following code of ethics for salesmen. The officers of the club are: Chairman, A. W. Merrill; vice-chairman, E. A. Simons; secretary-treasurer, John W. Crawford.

I. The salesman in all his business dealings with his fellowman shall be guided by the highest principles of honor and courtesy. While insisting on the recognition of his own rights by others, the salesman must never overlook or violate the duties and obligations he owes his fellowman.

II. While striving to advance the best interests of himself, his principal and his own line at all times, he shall not misrepresent or over-sell his line by making promises he cannot fulfill.

III. He shall consider it as great a crime against the common good to sell any article without making a just and reasonable profit for himself and his principal as it would be for him to be a party to any usurious transaction or selling at an exorbitant price. A living profit is just as essential to the general welfare as a living wage.

IV. He shall, in quoting prices, submit a separate price on the various different kinds and classes of materials. Quoting a lump price, including different kinds or classes of material, is unethical and unfair business competition.

V. He shall be a good loser, fight fair and shall not disgrace his calling by bribing another to get business.

VI. He shall act towards his fellow salesman as he would want his fellow salesman to act towards him under similar circumstances.

VII. He shall not make, nor even countenance, any uncharitable remark against his fellow salesman whom he shall look upon as a brother for a' that.

VIII. He shall not knock or misrepresent his competitors' line.

IX. He shall do his utmost to assist in stabilizing the entire heating and ventilating industry on a sound business basis. Reasonable profits and not mere volume of business is the criterion of business success.

X. He shall not betray the confidence or business secrets of his customer, nor carry tales from one place or office to another.

XI. He shall not encourage or help the incompetent or irresponsible to enter the heating and ventilating contracting business.

XII. He shall market his goods only through the proper generally recognized channels.

XIII. We as salesmen maintain that just as grave a crime has been done against the economic welfare and the common good when a buyer, through cut-throat competitive conditions or sharp, dishonest buying practices, purchases an article at such a low price that it does not include a fair profit to the seller as when the seller or salesman sells an article at a price that carries an unjust and exorbitant profit. A just profit to the seller and fair value for money expended to the purchaser is the criterion of a just business transaction.

XIV. He shall advise the owner to place his work through proper architectural, engineering and heating and ventilating contracting channels.

XV. He shall combat at all times the heathenish principle of *caveat emptor*, ("let the purchaser beware") and shall give his customer and the public just value for money received.

XVI. We salesmen believe in the doctrine of human brotherhood where all co-operate and work for the good of one another.

XVII. What does it profit a salesman if he obtains the greater bulk of the business without making a reasonable profit and suffers the loss of the goodwill and respect of his fellowman?

View in Main Exhibit Hall, Power Show

At the New York Power Show

Of the 532 Exhibits 225 Were Devoted to Products Used in the Heating and Ventilating Industry

MATERIAL progress in the larger aspects of the air-conditioning industry and many refinements in design and construction of apparatus were evident to even a casual visitor at the Sixth National Exposition of Power and Mechanical Engineering, at Grand Central Palace, New York, December 5-10. As a matter of fact, the exhibits of heating and ventilating equipment, increasing adjuncts in previous Power Shows, reached such a proportion of the aggregate space that rumors were afloat of a separate heating and ventilating show for the future.

There was a grand total of 532 exhibits, of which 225 featured products properly listed as heating and ventilating equipment.

The Power Show was well done. The main floor of the Grand Central Palace, and three floors above, were filled completely with displays of interest. Nearly all were "working" exhibits, or included elements of movement. As a whole the show had a finished appearance—there were no blank spaces and there was a restful sense of uniformity without loss of individuality. Those in attendance upon the exhibits were attentive to the requests for information, in spite of being forced to constant repetition of the same phrases. Apparently little attempt was made to effect sales, but valuable contacts ripened into conferences and discussions for ultimate good. Exhibitors, almost without exception, expressed gratification at the outcome of their participation.

Official figures showed an attendance of more than 110,000, although this included several thousand "repeats." This was a healthy increase over similar figures for the 1926 show. Of the stable and growing interest in an exhibition of this character there can be no doubt.

AIR-CONDITIONING UNITS AND SQUARE GEARS

While it would be difficult to single out dominating exhibits, certain it was that widely-dissimilar displays drew more than their share of public interest and literally were jammed during the entire week. Two air-conditioning units for industrial application, and, more particularly, the as-yet-unannounced gas-fired air-conditioning unit for the home, shown by a prominent exhibitor, fascinated both lay and engineering visitors and kept quite an organization busy answering questions.

Vieing with these displays was a demonstration board about 50 ft. long, showing in motion more than 100 mechanical movements. These were mounted, each on a separate panel, so that the movement was transmitted from the back of the display board. There were all kinds of gears, link movements and pulley arrangements; intermittent motion derived from rotating shafts, and many kinds of piston and valve movements. The near-star of the exhibit was a pair of "wabble" elliptical gears, with their shafts not at right-angles to their faces. But the outstanding item of interest was a pair of square gears, meshing together with all the sang-froid in the world. Comments on these queer

gears were heard throughout the show, on the elevator, and, late one night, on a suburban train, where a heating contractor from a nearby city, who had come to New York just for the show, puzzled his brain to explain their working.

Incidentally, a visiting heating contractor found an afternoon all too short a time in which to "cover" the show. As a mathematician would look at it, allowing one minute for each exhibit would require nine hours, or an entire day, not allowing for the length of time it would take to walk up and down all the aisles on the four floors. It is safe to say that no one interested in the show, from a trade or engineering point of view, would be content with a one-minute allowance even as an average.

No one viewing the show as a whole, and possessed of a reasonable imagination, could fail to see therein a striking demonstration of the high degree of specialization that characterizes American industry to-day. Individuals, and groups of individuals, have seized upon problems apparently restricted to rather narrow confines, and, forgetting all else, have proceeded to develop methods or mechanisms and then gone on to refine, refine, and again refine.

To thousands upon thousands of people engaged in engineering and industrial work, it is but natural that keen competition is everywhere rampant. This adds stimulus to the desire to perfect; the rate of development, consequently, has been tremendous in many lines of endeavor.

Now, one of the most fascinating pastimes of the students of industrial progress is to follow down the trail of development and see where those who have brought a given process or device to a high degree of perfection for use in a narrow and well-defined channel, suddenly find it possible to convert, frequently with little change, their output to meet the crying need in some other remote line of activity. There were several vivid examples of this sort of thing in evidence at the show.

SILENCING GUNS, GASOLINE ENGINES AND COMPRESSORS

The Maxim silencer is known throughout the world as a device designed for firearms, for the purpose of "de-noising" the discharge. It is doubtful if Hiram P. Maxim, its inventor, had any other idea in his mind, during the long process of incubation of this device. Yet, at the Power Show, we find the Maxim silencers exhibited as applicable to both the discharge and intake of air pumps as used in the heating industry, and a list of the possible applications of the silencers include many widely-divergent fields, such as the internal-combustion engine, silencers to cut down the exhaust noise from huge Deisel engines, so that it is practically inaudible a few feet from the engine.

Then we find a dry air-filter, in several sizes, all small enough to be put inside of a hat. This has been evolved to its present state of near-perfection to remove dust and dirt from the air taken into carburetors of automobiles, especially of tractors employed in farming operation where huge clouds of dust accompany the operations of the machine. The step-by-step improvement in manufacturing methods for producing this filter, including the development of highly-specialized machines for performing required operations, forms the basis for an interesting story of considerable length. Suffice it to say that the manufacturer of this device suddenly awakened to the fact that there is a tremendously large and important field in the ventilation industry to which this filter can be adapted. Consequently, it was found at the Power Show as a highly-specialized product standing with one foot in each of these two widely-separated lines of endeavor.

As these conditions are multiplied again and again, one wanders from exhibit to exhibit in search of novel and outstanding examples.

IMPROVING THE GIFTS OF NATURE

Wood, in its natural state, has long been used as a material from which to construct pulleys. Then there comes a genius with a refinement in this utilization of Nature's materials. He cuts spruce into huge sheets, approximately ¼-in. thick. These are given a coating of special glue and piled one upon another on the paten of a hydraulic press. The grain of adjacent sheets is at right angles. The pile is then put under a pressure so tremendous that its thickness is reduced approximately one-half, and the sheets are squeezed so intimately together that the wood fibres of adjacent layers actually interlace. The resultant mass has almost doubled the density of the original material and has been found to provide a superior material for the manufacture of pulleys. Indeed so dense is the structure that gears can be cut with the same degree of accuracy and finish as would obtain if the material were iron or steel. Here is a fascinating example of the development of an idea with applications and uses in almost every conceivable phase of industry.

Not so many years ago, ventilation, in industry, meant the removal of obnoxious fumes and smoke from factory buildings. Only a few years ago was it definitely ascertained that human comfort, and undoubtedly human health, depended upon the maintenance of atmospheric conditions in which the proper temperature, a corresponding humidity and a definite amount of air movement were the controlling factors. Scientists and engineers designed, and the manufacturers constructed, what frequently were combinations of huge machines, designed to provide ideal atmospheric conditions in factories, schools, theaters, and other places where human beings were gathered together in large numbers. Gradually, the lines of demarcation between the various elements of such a composite mechanism disappeared and, within the last year, there has been produced for international marketing, a unit air-conditioning machine, combining all of the elements necessary to produce a proper atmosphere in any given industrial or commercial enclosure. And now, at the last moment, comes a further refinement, downward in size, but expanding tremendously in scope of application—the unit air-conditioning equipment for the home. The compactness of this gas-fired unit was almost incredible, and it might be said that it was the focal spot of interest in the show.

The foregoing have been taken merely as outstanding examples of development that could be seen in almost all of the 200 and more exhibits that were of specific interest to the heating and ventilating engineer. A concise recital of equipment exhibited by the various manufacturers would be meaningless and valueless. The Power Show is meant to be seen, and any story of it, beyond outlining its scope and the high points of achievement, as represented by what can there be found, leaves much to be desired.

Meeting of Heating and Ventilating Exhibitors

During the Power Show, a meeting of the heating and ventilating exhibitors was held at the Waldorf-Astoria Hotel, New York, December 9, to consider the interests of this group in connection with future shows. A resolution was adopted to the effect "that the members of the heating and ventilating industry should constitute and be represented as a group on the Exhibitors' Committee of the Power Show." If found necessary, it is planned to hold another meeting, in Chicago, of those interested in the heating and ventilating industry during the Power Show there.

At the New York meeting J. C. Matchett, of the Illinois Engineering Company, was chosen chairman, and the calling of a Chicago meeting was left to his discretion. Those represented at the meeting were American Blower Company, Barnes & Jones, Buffalo Forge Company, The Heating and Ventilating Magazine Company, Hoffman Specialty Company, Ilg Electric Ventilating Company, Illinois Engineering Company, Johnson Service Company, Mechanical Manufacturing Company, National Regulator Company, Herman Nelson Corporation, Rome Brass Radiator Corporation, Sarco Company, Inc., B. F. Sturtevant Company, Warren Webster & Company, L. J. Wing Manufacturing Company.

Death of James Doherty

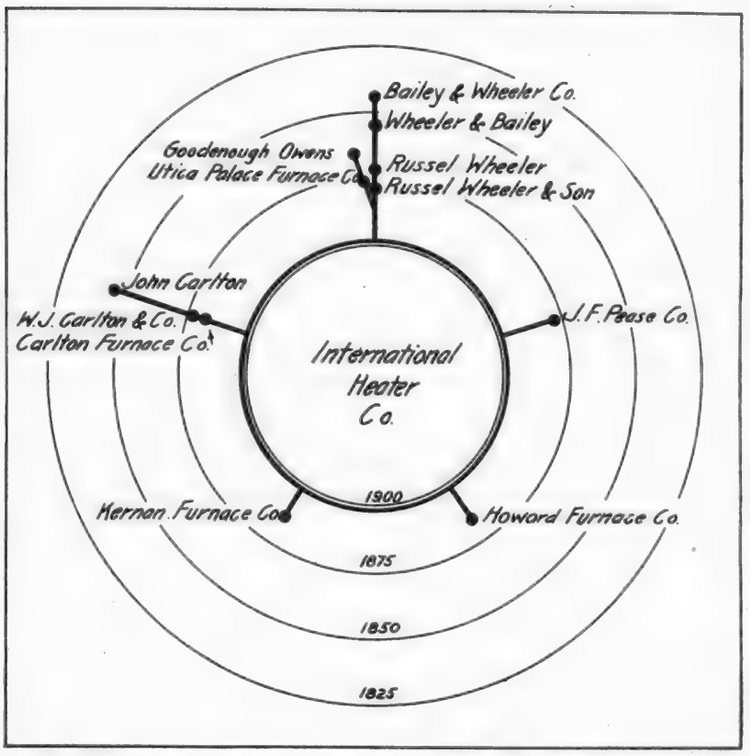
James Doherty, vice-president of the Utica Heater Company, with headquarters in Chicago, and one of the best-known men in the heating industry in the Middle West, died December 26. He was 57 years old.

Glancing Backward

High Lights in the Evolution of Leaders in the Heating and Ventilating Industry

IV—The International Heater Company

THE International Heater Company, incorporated in July, 1898, at Utica, N. Y., its present home, is the result of the merger, at that time, of five organizations in the heating industry. These companies, and their products, were as follows: Russel Wheeler & Son, Utica, stoves, warm-air furnaces, steam and water boilers; Carton Furnace Co., Utica, warm-air furnaces, steam and water boilers; Kernan Furnace Co., Utica, warm-air furnaces; The J. F. Pease Co., Syracuse, furnaces and combination heaters (combinations of warm-air with steam or with hot water); The Howard Furnace Co., Syracuse, warm-air furnaces.



Chronological Graph Showing How the International Heater Company Was Formed From Several Established Manufacturers

ONE ELEMENT DATES BACK TO 1842

The Wheeler company was the oldest in the group. This comany was organized in 1842, under the name of the Bailey & Wheeler Company, consisting of Joel C. Bailey, Russel Wheeler, and S. Alonzo Bailey. About the year 1856, Mr. Wheeler bought the interest of his father-in-law, J. C. Bailey, and the firm became Wheeler & Bailey. About 1870, Mr. Wheeler bought the interest of his brother-in-law, S. A. Bailey, and continued the business alone under his own name, Russel Wheeler. About July 1, 1877, Russel Wheeler's son, Frank E. Wheeler, was taken into the firm under the name of Russel Wheeler & Son. Later Francis Kernan, Jr., son of Senator Francis Kernan, was taken into the firm, and the name changed to Russel Wheeler Son & Company.

Up to this time the firm chiefly manufactured cooking stoves and parlor stoves, with side lines of agricultural caldrons, wagon skeins, sleigh shoes, etc., including the castings for the Carton furnaces, which they made for John Carton, the originator of that furnace. About 1880, the firm bought a controlling interest in the patterns, patents, and equipment of the Palace King furnaces, then manufactured by the Goodenow & Owens Company, organizing the Utica Palace Furnace Company, which in two or three years was absorbed by Russel Wheeler Son & Company. Shortly after this time they entered the steam and water heating boiler field, placing on the market the Palace King round boiler and the Palace Queen sectional boiler.

JOHN CARTON, A NOTED INVENTOR

The founder of the Carton Company was John Carton, who came from Ireland and settled in Utica in 1828, and started in business in 1847. He was a coppersmith by trade and of an inventive turn of mind. Some of his inventions, before turning his attention to the heating business, were the first steam vat for the manufacture of dairy cheese, and the first locomotive engine headlight to burn kerosene oil. His first patented invention in the heating line was the Carton warm-air furnace.

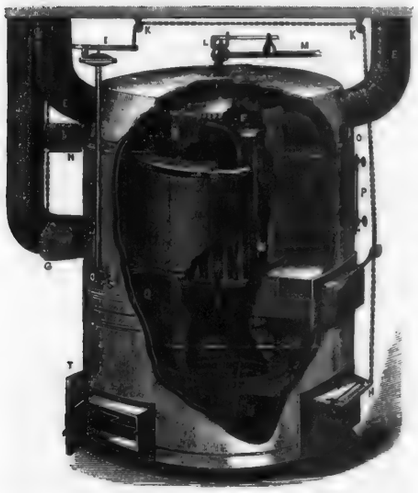
He first designed and patented the Carton self-feed magazine furnace. This was a very efficient heater, but as the art of molding was not advanced to modern standards, the walls of the double-cylinder and gas combustion-dome had to be constructed of sheet iron. This construction did not meet his idea of durability. It was his aim to make a furnace that would last a lifetime and he then designed and patented the Carton, all cast-iron, self-cleaning furnace. This same Carton self-cleaning furnace, with improvements, now is manufactured by the International Heater Company.

John Carton died at the age of 66, September 9, 1881, at the old Fifth Avenue Hotel, in New York. In 1882, his son, W. J. Carton, purchased from the John Carton estate all patterns of the Carton furnace, and formed a copartnership with John B. Jones and James Jones, under the name of W. J. Carton & Company. On July 23, E. A. Carton became associated with his brother, and they, with other members of the firm, incorporated under the name of The Carton Furnace Company. There was purchased the old Hamlin Wagon Works, and, a little later, the adjoining plant of the Utica Steam Engine and Boiler Works, at Utica, N. Y.

From this plant it expanded its line to eleven different series of heaters. In 1893, it started manufacturing the Carton steam and hot-water boilers in three series known as the Carton A, B, and C Series with 20-in., 30-in., and 40-in. widths of grates, respectively. All three series were cast-iron, screw-nipple, sectional boilers.

THE KERNAN FURNACE COMPANY

The Kernan Furnace Company was organized in 1890, by Francis Kernan Jr., James F. Kernan, Nicholas E. Devereux, William J. Owens, and William H. Landers. James Kernan brought to the business the experience of several years as a heating salesman, as in 1885, Mr. Owens and Mr. Kernan had established a business in Chicago, and were, five



Economy Steam and Warm-Air Heater Was Manufactured by John F. Pease and Company in 1882

years later, one of the largest customers of Russel Wheeler & Son Company.

The Kernan Furnace Company began in a very modest way, ordering 200 furnaces from its own patterns, cast in the H. Gilbert Hart foundry, Utica, N. Y. About four years after the firm was first organized it built its own foundry on part of the site now occupied by the International Heater Company, gradually expanding and developing its line and operating its own foundry.

The Howard Furnace Company started in business about the year 1887, in Syracuse, N. Y., and established a splendid reputation for high-grade cast-iron furnaces of exceptionally good wearing qualities. The old Howard double-radiator furnace was of a peculiar type and extraordinarily efficient. As it had two circular cast-iron radiators completely surrounding the furnace, this type of heater naturally was successful only where there was a very good draft and, therefore, the company also manufactured a single-radiator style of heater.

PEASE FURNACES BUILT IN CENTENNIAL DAYS

The J. F. Pease furnace business was started in Syracuse by John F. Pease, the patentee of the Economy hot air furnace, about the year 1876. The Pease Company also developed a splendid reputation for the durability of its heaters, but these furnaces were of a radically different type from the Howard. The Pease furnaces all had heavy sheet-steel domes and radiators instead of cast iron. The company manufactured two or three different styles of warm-air furnaces and also was very successful with its combination heaters, which consisted of the regular types of warm-air furnaces to which were added units for either steam or water heating.

As previously mentioned, the International Heater Company toook over the entire patterns, equipment stock and good will of the above companies on July 1, 1898, and for a time continued to manufacture the extensive line of warm-air furnaces, steam and hot-water boilers and combination heaters which were included in the lines of various companies. Successively certain models were dropped and others improved until there remained the present line of International furnaces and boilers. The present International Heater Company line of furnaces is developed as a result of a remarkably rich background of experience, supplemented by up-to-the-minute scientific research and technical knowledge.

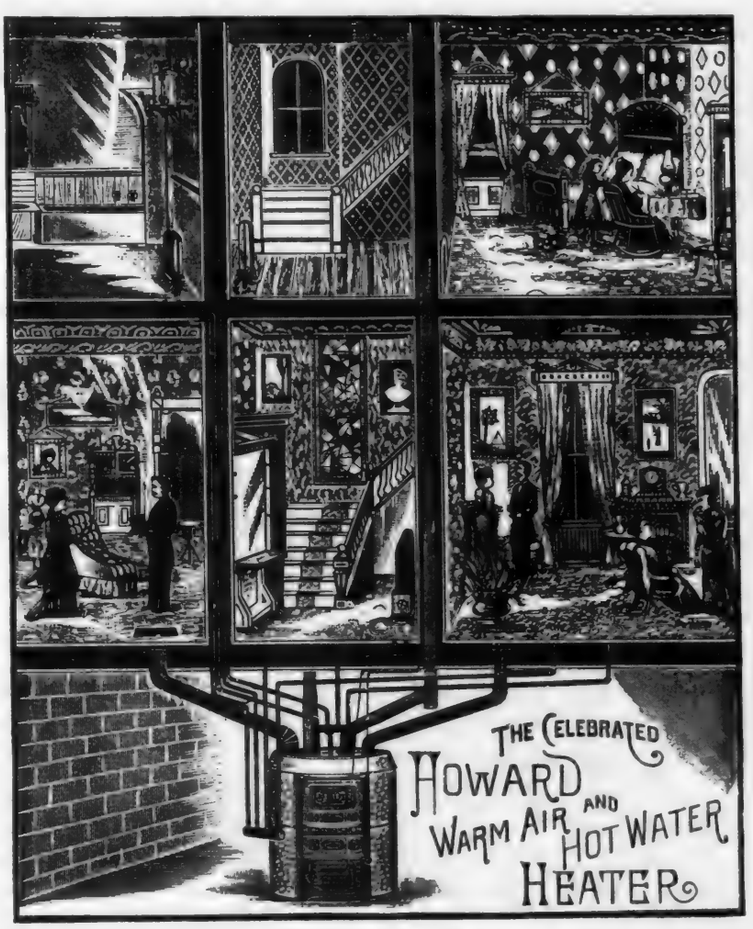
INTERESTING DEVELOPMENT OF HEATING EQUIPMENT

Some of the earlier furnaces were simply the open-dome type with smoke outlets either at the rear or at the top of the dome and merely a baffle plate or diving flue to divert the products of combustion. Later this type was superseded by one having a separate combustion chamber above the fire pot and a radiator to increase the length of fire travel and the heating surface. These radiators were of various types; some of them being made entirely of cast iron, and some of steel with an upper and lower cast-iron deck.

A modification of the open-dome type of furnace is one in which the functions of radiator and dome were combined by means of revertible flues at each side of the dome, compelling the smoke and gases to travel forward and then around each side of this flue to the smoke pipe at the back. Examples of this type were the Wheeler Palace Queen and the Wheeler Regent furnaces. The Queen furnace had a series of vertical tubes through which the ascending air circulated and which was entirely surrounded by smoke and gases. This form of construction greatly increased the heating surface and made the Palace Queen a very efficient heater.

OLD CATALOGS PORTRAY PROGRESS

A survey of the old catalogs shows many different varieties of grates, some have triangular bars, some square, hollow bars, and some grates of the flat, rotating and dumping type. There is a gradual succession of changes in the methods of suspending and fastening these grates, leading up to the present International herringbone triangular grate in which no bolts or cotter pins are used and which easily may be dropped down to remove a particularly obstinate clinker or to replace a burned-out grate bar.



Clothing, House Furnishing and Heating Styles in the Roaring '90's When the Howard Combination Hot Water and Warm-Air System Was in Vogue

The Scanty Secondary Heating Surface of a Typical Furnace of the Early '80's Used When Fuel Was Cheap

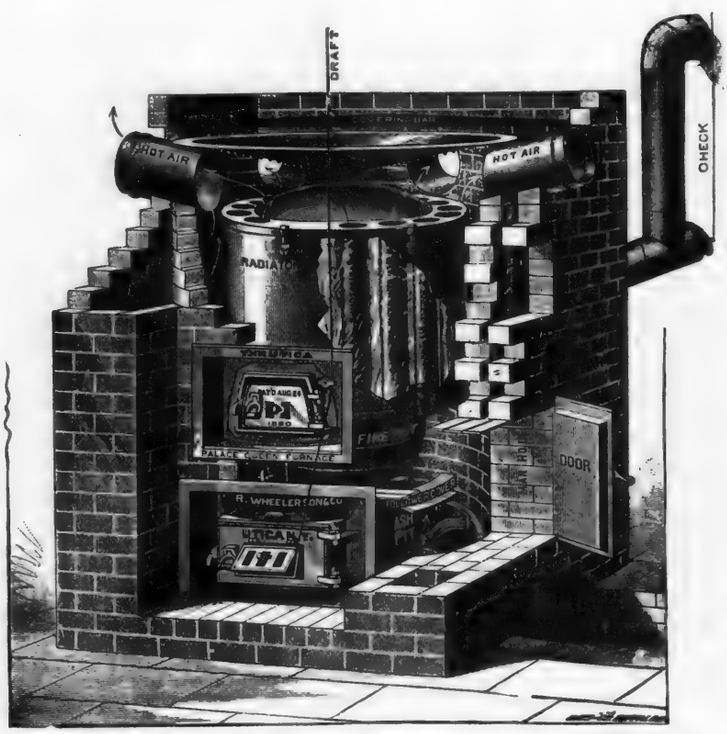
Among the various types of firepots may be found the one-piece type, both plain and corrugated, firepots with slots for the admission of auxiliary air, and firepots with projections at the side.

The modern International furnaces have full, cast-iron fronts, with ashpit, feed chute, and cleanout openings through the front to prevent leakage of dust and ashes into the warm-air chamber. Some of the earlier furnaces had only three-quarter fronts, and some just feed-door frames and ashpit frames bolted to the casing. Most of the early furnaces were set in brick but later the galvanized iron casing was developed.

In the development of cast-iron sectional boilers much experimenting was done to find a method of connecting the sections which would provide for the necessary expansion and contraction and still guard against leakage. The record shows that in one of the earlier patterns of round, horizontal sectional boilers, in which the sections were held together by tie-rods, a flat rubber gasket was used between the sections. This method was later supplemented by asbestos gaskets soaked in linseed oil. Neither of these methods of connecting proved satisfactory and a corrugated copper gasket was tried. This method of construction was followed by cast union connection between the sections.

The old Wheeler Palace Queen sectional boilers and Carton sectional boilers were of the header type of construction, utilizing screw nipples to connect the headers to the sections. This style of boiler was later abandoned in favor of the push-nipple type now used. At first these push nipples were made of wrought iron, but later cast-iron was adopted.

A new development in the boiler field was the Palace Regent boiler, originally manufactured by Russel Wheeler & Son, in 1897. This was unique in the heating field as it was a rectangular boiler cast entirely in one piece with the exception of the ashpit. The production of such an intricate piece of molding and core work was very much of an accomplishment, especially in those days before foundry practice had advanced to its present level. Palace Regent boilers were reputed to be wonderful steamers and enjoyed a wide popularity and an extensive sale for a great many years, but finally were abandoned after the development of the newer patterns of sectional boilers which could be produced and sold at lower prices.



The Palace Queen Tubular Furnace Manufactured by Russel Wheeler, Son and Company, in 1886 Exemplified Advanced Practice of That Period

Fifty Years of Achievement

Buerkel and Co., Inc., contracting engineers, Boston, Mass., has published a brochure, excellently printed and illustrated, in the form of reminiscences by John F. Buerkel and William H. Oakes, the founders of this well-known organization. Naturally, the story is told in a personal way and, for this reason, it is extremely interesting reading. Mr. Buerkel begins with the story of taking over the heating business of William Newton, in Boston, in 1877, and

John F. Buerkel, Who Founded Buerkel and Company in 1877

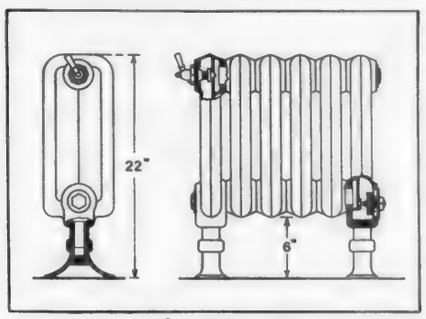
Mr. Oakes, who assumed the presidency in 1894, carries on the tale to the present day. An imposing list of buildings and groups of buildings, for which complete plans and specifications for heating and ventilating systems have recently been made, occupies several pages and there are included several views in the offices of the company in Union Park Street, Boston.

WEATHER VEIN, the periodical of the Carrier Engineering Corp., Newark, N. J., Vol. 7, No. 3, may be termed a radio number. Some idea of the timeliness of this issue may be had from the fact that it is devoted largely to the air-conditioning equipment of the National Broadcasting Company's new building at Fifth Avenue and 55th Street, New York, which now houses the offices and studios of the company, including the broadcasting stations of WEAF and WJZ. Much of the early history of radio and of broadcasting is told in a readable manner, followed by an account of the development of the National Broadcasting Company and the recent establishment of its blue and red net works of stations. In describing the equipment of the new building, THE WEATHER VEIN gives an account of the way the air throughout the building is "manufactured" by the Carrier method, making it possible to broadcast with comfort, despite any condition of excessive heat or cold outdoors.

New Apparatus and Appliances

New Idea in Radiator Construction

A radiator designed primarily for hospital work, but which has been found equally desirable for all types of buildings in which direct radiators are to be used, has been brought out by the T. A. Ridder Co., Inc., Boston, Mass. It is known as the Tarco radiator. Its distinguishing characteristic is that the piping connections are embodied in the radiator, serving, in the floor type, also



Tarco Radiator With Union Base Supports

as a support. In the wall type, the piping has also been united into a single union base support. The supply valve and return trap are enclosed in the radiator, thus eliminating all visible piping. Tarco radiators are furnished in single-column, two-column and three-column types, in heights ranging from 22-in. to 34-in.

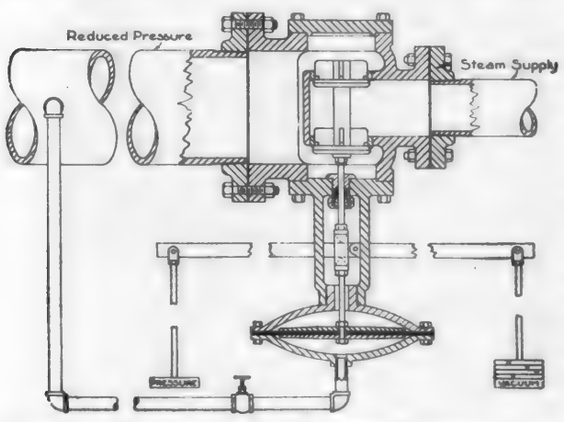
Sub-Atmospheric Pressure-Reducing Valve

To provide for the uniform maintenance of a steam pressure lower than that generated, in order that a differential vacuum system can properly function, there has been developed, in the laboratories of C. A. Dunham Co., Chicago, a pressure reducing-valve operating over a sub-atmospheric range.

In using steam at a pressure lower than that at which it is generated or supplied, the maintenance of the desired lower pressure depends upon maintaining a rate of supply equal to the rate of use. If the rate of steam supply from the source at the higher pressure is greater than the rate at which the steam is being condensed at the desired lower pressure, the lower pressure cannot be maintained. Therefore, the lower pressure will tend to increase above the value desired, approaching the higher pressure (the pressure at which the steam is being supplied). This fact is made use of in arranging the operation of the sub-atmospheric pressure reducing valve.

Sub-atmospheric pressures may be secured by withholding or retarding the admission of steam to the system until the desired sub-atmospheric pressure is reached and supplying it at the proper rate when the desired pressure is reached. If the sub-atmospheric pressure becomes less (vacuum becomes greater) than desired, the wider opening of the valve and admittance of more steam will bring the sub-atmospheric pressure up to the desired value, owing to the rate of steam admission being more than the rate of use. That is, the admission of steam at a rate exceeding the rate of use causes an increase in the sub-atmospheric pressure (reduction of vacuum) which operates the valve, reducing the opening so as to again establish the desired rate of admission.

The action of the valve will be more apparent by referring to the illustration. The valve lever is arranged with two ends. When a sub-atmospheric pressure or a vacuum is desired, the weights are placed on the end which holds the valve closed by the weights. The diaphragm chamber is connected to the steam main in which the reduced pressure obtains. The sub-atmospheric pressure will become less (the vacuum greater) under the action of the vacuum pump. One side of the diaphragm has atmospheric pressure upon it, the other is subjected to the pressure prevailing on the lower side of the reducing valve. The production of a vacuum (or a pressure less than atmosphere) tends to cause the diaphragm to lift the valve from its seat against the action of the weights. With the continued increase in vacuum a point will finally be reached where the diaphragm will overcome the action of the weights and open the valve by lifting it from its seat.



Dunham Sub-Atmospheric Pressure-Reducing Valve

Obviously, it is the difference in pressure between atmospheric and the sub-atmospheric pressures, which supplies the force to open the valve. The more weights placed on the valve lever the greater the vacuum secured. The more the weight is increased, tending to hold the valve closed, the less the sub-atmospheric pressure (greater vacuum) required to deflect the diaphragm and open the valve by lifting it, against the action of the weights.

When it is desired to use the valve to control the pressures above atmosphere, the weights are removed from the end of the lever, which causes them to tend to hold the valve closed, and are placed on the end which tends to hold the valve open. When in this position the admission of steam into the reduced pressure side causes the pressure to approach the pressure in the supply, or high pressure, side of the valve. Since the diaphragm chamber is in communication with the reduced pressure side of the valve, the increase of pressure in it raises the pressure in the diaphragm chamber above atmosphere, causing the valve to be closed down and seat against the action of the weights.

New Design of Fan for Ventilators

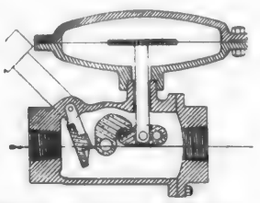
A fan-blade design presenting interesting features, and for which high efficiency is claimed, is marketed by the Sinclair Equipment Corp., Congress and Peoria Sts., Chicago, under the name of the Super Hi-Lo propeller fan. There are

Super Hi-Lo Propeller Ventilator Fan

four blades, each rather suddenly twisted close to the hub. It is stated that this blade produces a solid column of air, moving it with a minimum of energy. The motor is enclosed and the passage of the air column maintains it at low temperature. Lubrication is provided for 3000 hours of operation. Hi-Lo fans are built in several sizes, capable of moving from 1600 to 5350 cu. ft. of air per minute.

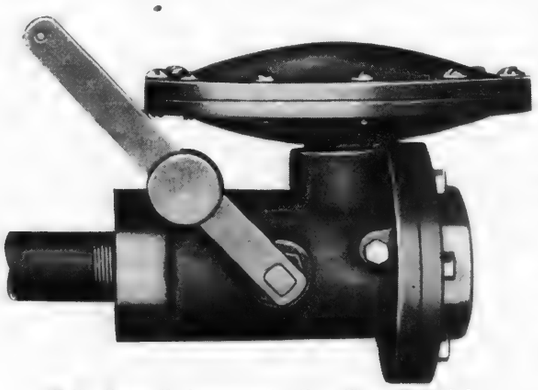
Automatic Gas Safety Shut-Off Valve

To prevent accidents, due to the renewal of gas service after a shut-down, where gas is used for firing boilers, the "Life-Saver" automatic shut-off valve has been placed on the market by the Universal Smokeless Boiler Co., Ravenna, O. This valve is set at the factory



Working Parts of "Life-Saver" Gas Valve

at ½ oz. pressure. If the gas supply falls below ½ oz., the valve automatically will close and must be opened by hand. The device is simple, efficient



"Life-Saver" Automatic Gas Shut-Off Valve

and carefully made, and as it is in continual operation, it will not corrode or get out of order. A lever and weight are used as the closing force.

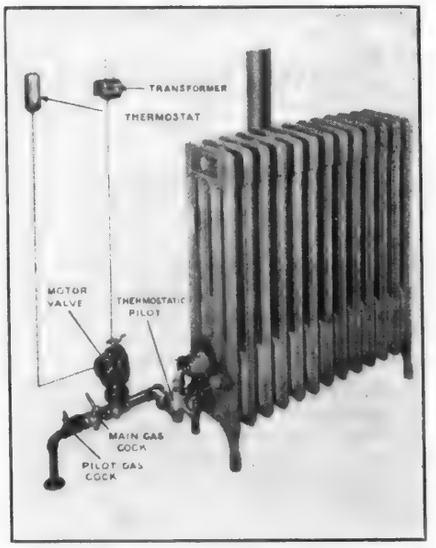
Maxim Silencers for the Heating Industry

Following the development of the Maxim silencer for use on firearms, Hiram P. Maxim naturally began to work out applications for industrial purposes where it was desired to muffle noises caused by intermittent air or gas disturbances. The Maxim silencer is an air-wave-trap. It will allow air or exhaust gas to pass through with entirely negligible resistance. The spiral silencing unit offers no baffling and no reversal to the flow of air or gas. Naturally one of the first fields to be entered was that of the internal combustion engine, and the largest sizes of Diesel engines are now successfully muffled with these units. In addition to practically eliminating output noise, the silencer can be used to destroy the objectionable thumping noise on intakes of certain types of air compressors, both of the reciprocating and rotary types.

The noise and pulsation in vacuum-pump discharge is similar to that of the air compressor suction and can be handled in the same fashion. The discharge noise of rotary vacuum-pumps is made by the sudden uncovering of a pocket formed by the two rotating impellers into which the outside air rushes and is then suddenly expelled, setting up noises and pulsations. The silencer on vacuum pump discharges will practically eliminate the discharge noises without imposing a back pressure or resistance to the flow of gas or air that is being discharged. Technical literature and complete engineering data are available from the Maxim Silencer Co., Hartford, Conn.

O-E Flow-Control Fitting

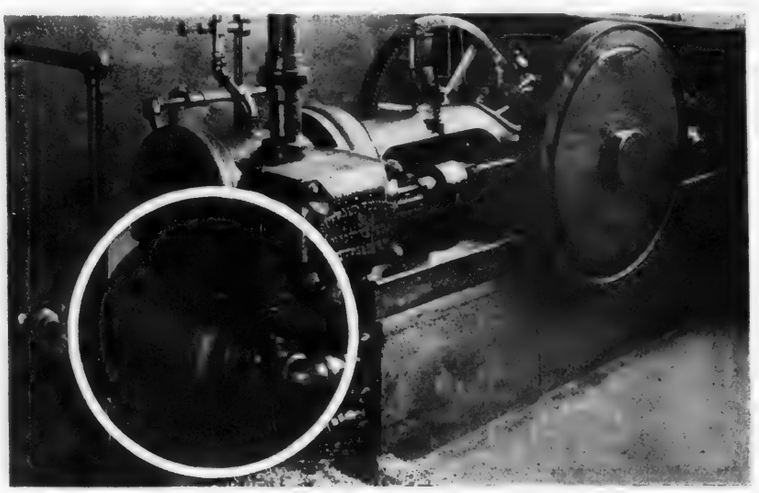
A refinement in a metering device for regulating the flow in hot-water systems, either gravity or forced circulation, or in ice-water circulating systems, is the O-E flow control, designed by O. W. Ott, consulting mechanical engineer of Los Angeles, and will be manufactured and marketed by the O-E Specialty Mfg. Co., Milwaukee, Wis. This fitting is made in all the commonly-used sizes and has the same roughing-in dimensions as the standard union elbow. It consists essentially of a wide-angle needle-type valve, the stem having a comparatively fine thread and being slotted for screw-driver adjustment. The portion of the fitting above the stem is covered with a flush screw-in cap, the construction being such that after the valve is once set by the heating contractor, the homeowner cannot open or tamper with it. The design of this fitting makes it possible to adjust the flow to any particular radiator without removing water from the system. The fitting can be applied equally well to the closed gravity or forced circulation systems.



Clow Thermostatic-Control System Applied to Gasteam Radiator

Thermostatic Control with Gasteam Radiation

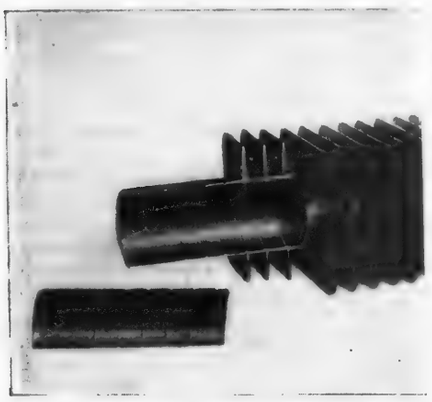
A method of controlling the generation of heat in Clow Gasteam heating systems is announced by James B. Clow & Sons, 201 North Talman Ave., Chicago. In such an installation, a room temperature-thermostat is placed in a centrally located room and automatic pilots are installed on each Gasteam radiator. The thermostat circuit is taken from the 110-volt house main through a transformer. The thermostat can be set to maintain any desired room temperature and if different temperatures during the day and night period are required, this can be accomplished through a clock thermostat. It is stated that the cost of installation of such a system is less than for a boiler system, using gas or oil, thermostatically controlled. This combination is particularly adaptable to garage heating as the thermostat can be so set that, while the interior of the garage is maintained well above the freezing point, the car is not heated to such a temperature that driving it out into sub-zero weather will result in peeling of the paint or other finish.



Maxim Silencer Applied to Vacuum Pump

Convecto Heat Units and Cabinets

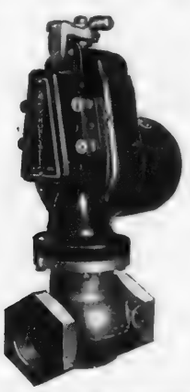
A novel method of fabricating extended-surface radiators is that used by the Metal Stamping Co., Inc., Long Island City, N. Y., in Convecto units. These are made of 1½-in. copper tubes with copper fins almost made integral with the tube by a special process in which the copper is expanded on each side of each flange in such a way that a very tight metal-to-metal joint results. Tubes are expanded and rolled into headers, making a unit that is said to be leak-proof, non-corrosive, and free from mechanical defects. Single units are tested to 250 lbs. hydraulic pressure, are 4-in. square and are made in three lengths, 25-in., 33-in. and 41-in. Double units are the same height and length and twice the width. Standard units are available with capacities of 22 sq. ft. of steam radiation to 60 sq. ft., and larger sizes are made to order. Special units for use in bath rooms are built in sizes from 4 to 15-sq. ft. capacity.



Cutaway Showing Construction of Convecto Extended Surface Heater

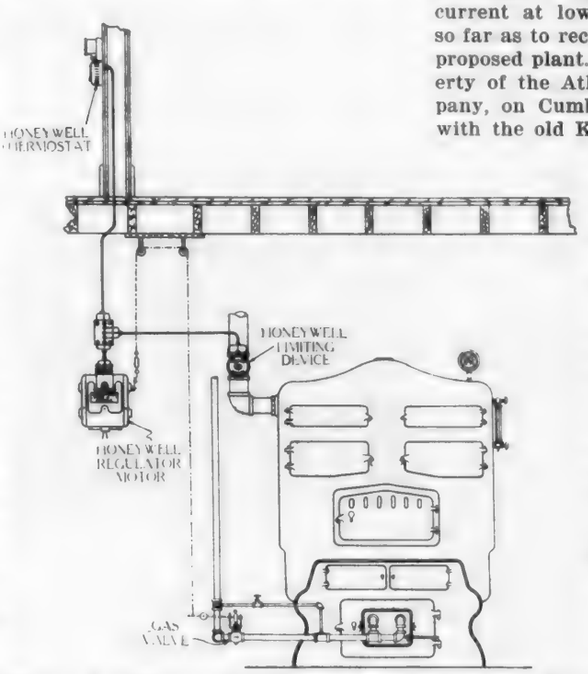
Electrically-Operated Gas Valve

Minneapolis-Honeywell Regulator Co., Inc., Minneapolis, Minn., has placed on the market an electrically-operated gas valve, designed particularly for use with domestic gas-fired boilers. This valve is to be used with either a Honeywell clock-pattern or plain-pattern thermostat automatically to control the gas supply to the furnace burners.



Minneapolis-Honeywell Motor-Operated Gas Valve

This device consists essentially of a plunger-type valve with extended stem in which teeth are cut, forming a rack. A miniature induction-type motor drives, through a chain of gears, a pinion meshing with this rack. When the circuit from the room thermostat is made, the rotor revolves and, through the rack and pinion movement, lifts the gas valve from its seat. As long as the circuit is continued closed, current flows through the fields of the motor and the valve remains in the open position. As soon as the circuit is broken—either through the action of the thermostat, or in the event of current failure—there is no power to keep the valve open and a spiral spring acts to pull the stem down, shutting off the gas. The actuating spring is of monel metal and exerts a maximum working pressure of 25 lbs. per sq. in. on the valve seat. A double leather diaphragm is used to seal the gas from the valve operating mechanism. This valve is made in several types to meet various requirements, and for use either with steam or water boilers, or warm-air furnaces. In the event of current failure, this valve can be operated manually by means of a lifter on top of the plunger, which makes it unnecessary to provide a by-path around the valve in order to provide heat in this emergency. When current service is resumed, the valve automatically comes under control of the thermostat. The power consumed by the motor is less than 25 watts and the valve can be used successfully where the gas pressure does not exceed 12 in. of water, or about 8 oz.



This Is the Minneapolis-Honeywell Motor-Operated Gas Valve with Snap-Acting Valve

Central Station Heating Notes

Knoxville, Tenn.—A movement to establish a central heating system in Knoxville, and a central coal storage plant for merchants, has been launched by a group of 22 prominent business men, including City Manager Roehl and Councilman E. C. Fretz. A committee composed of Prof. W. R. Woolrich, of the Engineering Department of the University of Tennessee; J. H. Anderson, J. B. Ramsey, and Councilman Fretz, was appointed to study the project and report on the best method to be followed in constructing the plant. According to their report it is entirely possible for users of steam from the plant to install turbines in the basement of buildings for the generation of electric current at low cost. The report goes so far as to recommend two sites for the proposed plant. One site is on the property of the Atlantic Ice and Coal Company, on Cumberland Avenue, together with the old K. S. & E. depot site; the other on the property immediately east of the Tennessee River Bridge, on Front Street. It is proposed to organize a corporation with $400,000 capital, to construct and operate the plant which would serve the entire business district of the city, south of the Southern Railway, and bounded by First and Second Creeks.

Nashville, Tenn.—An appropriation of $150,000 has been made by the State Board of Education for the building and equipping of a new science building for the Tennessee Polytechnic Institute and the improvement of the ground. The equipment will include a central heating plant.

Fort Wadsworth, Staten Island, N. Y., is to have a new heating system costing $18,775 to supply heat to 22 buildings at the fort, according to an announcement made by the War Department. The system is to replace the present warm-air heating equipment.

Goshen, Ind.—Although a petition to prevent the discontinuance of the city steam heating plant was dismissed without a hearing, it is definitely stated that the plant will be continued in operation for this winter at least, and a new plan of operation will probably be adopted before next year. In dismissing the petition Howard Ellis, a member of the Public Service Commission, made the point that no petition to discontinue the plant was on file with the commission. The city, it appears, has never filed any petition with the state board, although notice had been given to users of city steam that service would be discontinued.

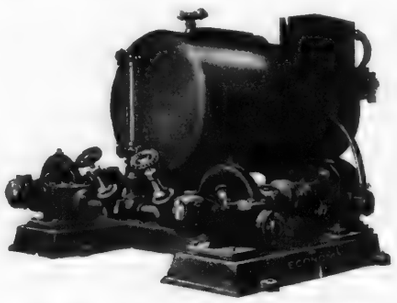
New Trade Publications

LEADER STEEL BOILERS AND HEATING EQUIPMENT are described in Bulletin 563, issued by Leader Iron Works, Decatur, Ill. The feature of this catalog is the Koolstack steel heating boiler for which high efficiencies are claimed. The fact that this equipment is virtually a down-draft boiler makes it possible to secure exceptionally low flue-gas temperatures. A feature of this boiler is the automatically-opened by-pass, short-circuiting the down-draft portion of the boiler when draft conditions are poor at starting. The catalog also features a line of water heaters and illustrates and describes the laboratory at the plant which is under the direct supervision of Prof. J. A. Polson, of the University of Illinois.

IDEAL HOT WATER SUPPLY MANUAL is a publication distributed by the American Gas Products Corp., 376 Lafayette St., New York, in which tables of general information are presented from which calculation can be made to determine the proper and most efficient gas-boiler equipment required to give any desired quantity and temperature of service water. The data are presented in very usable form and should be of value to every contractor.

GURNEY BOILERS AND RADIATORS are described in a catalog received from Gurney Heater Mfg. Co., 93 Oliver St., Boston, Mass. This catalog contains a complete listing of down-draft smokeless boilers, sectional boilers of several types, round sectional-boilers and water heaters, as well as radiators and heating specialties manufactured by this company. Size 4½-in. x 6½-in. Pp. 124.

ECONOMY PUMPS of the single and multi-stage centrifugal type, for many applications, are described in an elaborate loose-leaf catalog issued by the Economy Pumping Machinery Co., 3431 West 48th Place, Chicago. One such has been especially designed as an electric-driven pump and receiver for various uses in connection with large heating plants. Full technical data and dimensions are given.



Economy Duplex Automatic Condensation Pump and Receiver

FACTS AND FIGURES ON INSULATION, published by the United Cork Companies, Lyndhurst, N. J. (A.I.A. File No. 37-a-1), is devoted to the history of insulation, the manufacture of cork board, designs of insulation, modern scientific methods of erecting corkboard and specifications for fifty types of construction. It is prepared with special reference to the refrigerating industry. Embodied within its cover are 84 pages of data pertaining to the insulation field.

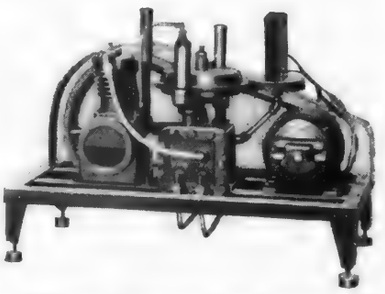
WHEN YOU USE JOHNSON UNIT HEATERS is the title of a folder issued by Johnson Fan & Blower Co., 1319 West Lake St., Chicago. This folder describes and illustrates a number of interesting and important installations of Johnson unit

Johnson Unit Heater in Airplane Hangar

heaters, including what is said to be the largest single unit ever built, installed in the hangars of a large automobile manufacturer. This unit has a capacity of 26,000 cu. ft. per min. Another illustration shows a group of ceiling-type units in a bay of an automobile factory, the size of the room being 80 ft. x 500 ft. and 35 ft. to the top of the monitor.

HOW TO LOCK OUT AIR—THE HEAT THIEF, is the title of a brochure published by the service department of the Hoffman Specialty Company, Inc., 25 West 45th St., New York. This booklet is designed to explain the working principles of Hoffman valves and visibly to portray the advantages of their use. A conception of the scope of the story may be had from the chapter headings: the one big objection to ordinary steam heat; how a one-pipe steam heating system operates; how to vacuumize a one-pipe steam heating system; why Hoffman No. 2 vacuum valves save one-third of your fuel; how Hoffman No. 2 vacuum valves pay for themselves in less than two years, and an appendix of testimonial letters—what some users say.

The mechanical make-up of the book is excellent, the illustrations are exceptionally well-done and the frontispiece is by an artist of high repute—Norman Rockwell.



Gas-O-Matic Machine for Domestic Use

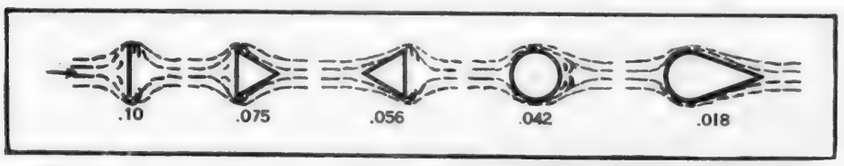
GAS-O-MATIC GAS-MAKING MACHINES are described in a circular received from Tolectro Corp., 500 Fassett St., Toledo, O. These machines consist essentially of a small air compressor, belt-driven by a fractional horse-power motor, the operation of the machine being controlled by automatic and safety devices. When the machine is set up, a 110-gal. steel drum is buried in the ground outside of the house and properly connected to the machine with piping. Air from the compressor is forced through holes in a section of pipe which rests at the bottom of the gasoline tank. Passing through the high-test gasoline, this air carries away gas vapor which is piped back to the machine. A safety switch automatically stops and starts the compressor, so that a gas pressure for best results is maintained at all times in the tank. The machine generates gas at the rate of 250 cu. ft. per hr., which is more than twice the amount of gas normally consumed by a kitchen range, auxiliary heater, water heater and hot plate, operated together. It is stated that all of the utilities of the house, with the exception of the heating plant, can be served with this gas at a cost approximating that of manufactured gas. The machine occupies a space of less than 3 sq. ft.

THRUSH SYSTEM OF HOT-WATER HEATING is the subject of a sales manual issued by H. A. Thrush & Co., Peru, Ind. This is for jobbers' salesmen and is written in non-technical language and illustrated with simple, clean-cut diagrams and drawings. The manual is prepared on the basis of a series of questions and answers covering heating methods: The gravity versus closed system, the Thrush system, parts and their functions, and so on through the entire gamut. This treatise has been carefully prepared and should be of value to anyone interested in water heating systems. Size 6 in. x 9 in. Pp. 48.

GOING LIKE A BLUE STREAK is the title of a folder announcing a new line of boilers and furnaces manufactured by Richardson & Boynton Co., 260 Fifth Ave., New York. A new series of "Richardson" round boilers and "Perfect" warm-air furnaces now appears in rectangular form, the boiler and furnace insulation being formed as part of the unit. The result is a well-lagged heating plant, conforming in looks to the most advanced practice.

STREAMLINE—AN ENTIRELY NEW PRINCIPLE IN AIR CLEANING is the title of a folder circulated by the Reed Air Filter Co., Inc., Louisville, Ky. This circular is designed to acquaint the reader with the reasons for the streamline shape of the baffles in the Reed filter. The story of the flow of air through the Reed filter is told as follows:

Many air filters operate on the adhesive impingement principle, causing the dust-laden air to impinge against adhesive-coated baffles. The shape and arrangement of these baffles determine both air-cleaning efficiency and resistance to air flow. Several shapes suitable for baffles, all having the same cross-sectional area, with their relative resistance factors are shown.



Relative Resistance Factors, Different Types of Baffles Having Same Area

The streamline baffle, similar to the low wind-resistance shape developed for aeroplane service, has the lowest known resistance factor. This makes it possible to secure a greater number of impingements, which means greater efficiency in dust removal without a corresponding increase in resistance. The streamline baffle also has other inherent advantages which make its use particularly desirable in an automatic filter.

The outline of the air passages shows their similarity to a venturi tube. At certain points, the air passes through these venturi-shaped orifices at a high velocity. The solid dust particles are carried forward and forcibly impinged against the front of the adhesive coated baffles in the next row. At the same time the air is allowed to expand, the velocity decreases, preventing the dislodgment of the accumulated dust deposits. This operation is repeated successively through the filter.

RECORDING PSYCHROMETERS are described in a folder recently issued by The Foxboro Co., Inc., Foxboro, Mass. This long-distance recording psychrometer—sometimes called a wet and dry-bulb thermometer—consists of two recording movements enclosed in a round case, with a water box upon which the sensitive bulbs are mounted. It eliminates the necessity of entering the kiln, drying room, or any other industrial process-room where definite conditions of humidity accelerate production, to take readings, because the recording mechanism can be installed outside. The instrument can be placed near the regulating valves, and the bulbs located any distance, up to 200 ft., from the recording mechanism. The wet-bulb is, according to type, either mounted directly over the box and covered with a special wick extending into the water, or enclosed within a porous sleeve receiving a continuous flow of water. A second porous sleeve surrounding the water box acts by rapid surface evaporation to keep its contents cool. To secure accurate records from any psychrometer at temperatures under 110° F., it is necessary to have a free passage of air over the wet bulb equivalent to not less than 15 ft. per sec. Where natural circulation is not obtainable the recording instrument is equipped with a small motor-blower. Two sizes, the 10-in. and 12-in., are the standard equipment, with 5 ft. to 200 ft. connecting tubing according to requirements, and the instrument can be calibrated for all standard ranges of temperature from 32° F. to 212° F.

A close-coupled recording-type psychrometer also is described, which serves to record humidity in rooms where controlled conditioned air at temperatures below 110° F. is used. To insure proper circulation it is fitted with a small motor-blower. In processes where exact control of relative humidity is essential, the Foxboro humidity recorder-controller is offered to control both temperatures and humidity, and record conditions on a 12 in. chart. It is air-operated, and especially useful in simplifying drying operations.

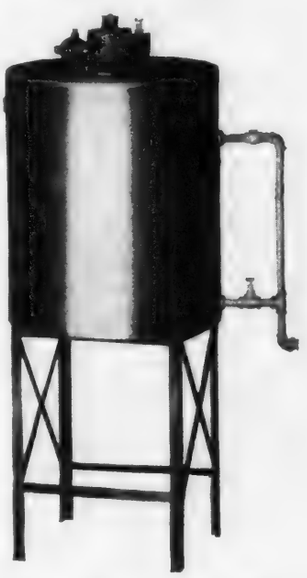
VENTURAFIN NUMBER 2 appears on the cover of a brochure issued by the American Blower Co., Detroit, Mich., describing a unit-heater model smaller than the No. 1 unit, and designed to provide heat equivalent to 125 to 200 sq. ft. of cast-iron radiation. This Venturafin unit is installed against the wall, above the breathing line, with a duct behind the wall surface leading to an intake register near the floor. The fan in the unit drives the air through the extended-surface steam radiator, furnishing a definite circulation of heated air. The catalog is well illustrated with photographs and diagrams, showing this unit and some of its applications.

ARE YOU LOSING MONEY THROUGH THE ROOF? is the title of a little folder being sent out by the United States Gypsum Co., 300 West Adams St., Chicago, describing the insulating value of Thermofill. This plaster-like material comes in 50-lb. bags and the insulation of a ceiling is only a matter of filling between the floor joists in the attic and striking off to a uniform thickness. The booklet also shows the method of insulating where the attic is to be utilized. In this case, Sheetrock is nailed directly to the rafters and the space behind is filled with dry Thermofill. The illustrations and descriptions in the booklet are of sufficient clearness to enable anyone without mechanical skill properly to use this insulation material.

WALWORTH BRASS VALVES is the title of an elaborate little catalog issued by the Walworth Co., Boston, Mass. This publication covers in great detail the complete Walworth brass line, giving dimensional tables, service recommendations and price lists. It is copiously illustrated in color, showing the portions of each valve that are brass and those that are iron or steel. An interesting feature of the catalog is the back cover, on which is an unretouched photograph of a Walworth-Kewanee regrinding valve that has been in service since 1911 on a union testing machine at the Kewanee works. This valve was opened and closed every time a Kewanee union was air-tested under water. In 14 years of service, this valve was opened over 18,000,000 times and during that period it was necessary to regrind the valve only five times.

WING TURBINE BLOWERS are featured in Bulletin 87, issued by L. J. Wing Mfg. Co., 352 West 13th St., New York. An exceptionally fine presentation is made of the design and construction of the Wing turbine blower, and comprehensive chapters are devoted to the installation of these units with hand-fired boilers and with automatic stokers. Tabulated and graphic data furnish all the necessary information in regard to dimensions and performance. Size 8½ in. x 11 in. Pp. 24.

THERE ARE TROUBLE-FREE OIL-BURNER ACCESSORIES appears on the cover of a folder being mailed by the Monroe Machine Tool Co., 733 W. Jackson Blvd., Chicago. This bulletin features the Monroe automatic oil pump for oil-burner installation and the Monroe oil strainer. Also, there is announced a new type TJF oil-pump unit, consisting of a pump similar to the well-known TJU, but set on the top of a 35-gal. steel tank, furnishing an emergency reserve of oil.

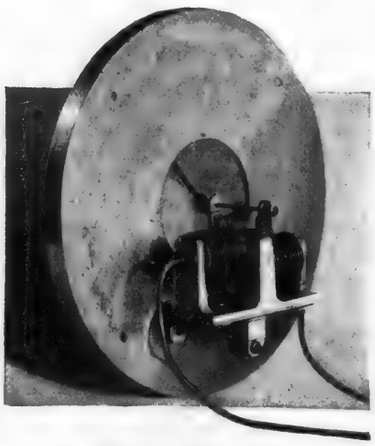


Monroe Type TJF Oil Pump

DATA AND SPECIFICATIONS FOR STREAMLINE AIR FILTERS forms the subject of a folder issued by the Reed Air Filter Co., Louisville, Ky. In a highly condensed form there are given all data necessary for the proper selection of a filter and of its power and pump. Dimensions are given, with all minimum clearances and limitations. The last cover illustrates other specialties, such as furnace filters, unit air-filters and window ventilators, manufactured by this company.

COUNT THE COST—COUNT THE GAIN appears on the cover of a folder being mailed by the Kewanee Boiler Co., Kewanee, Ill., featuring Kewanee round and rectangular water-heating garbage burners. Stating that one ton of garbage is the equivalent of 200 lbs. of coal, the sanitary value of the heater in destroying garbage also is emphasized.

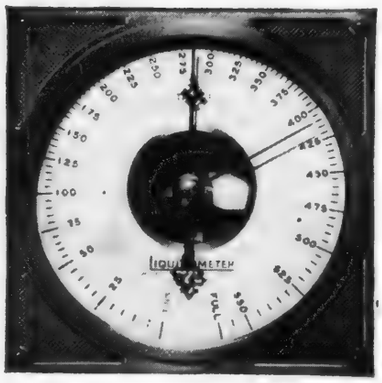
LIQUIDOMETERS, of the Senior and Junior types are featured in two folders issued by the Liquidometer Co., 173 Thomson Ave., Long Island City, N. Y. The Senior type has a circular dial 12-in. in diameter, the hand moving through an almost complete circle. These instruments are used to give readings of tank contents, and the dial may be installed at any reasonable distance from the tank. The mechanism is hydraulic, employing a pair of sylphon bellows, and



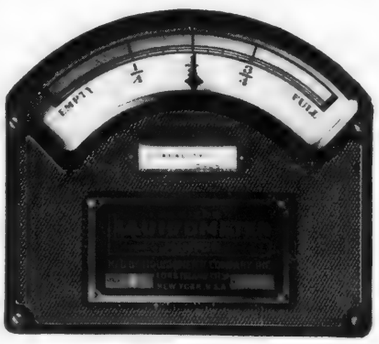
Mechanism Operating Indicator Needle of Liquidometer

the instrument is manufactured with the same precision as is a high-grade watch. The Junior Type is similar in operation to the larger, but the dial is only 90° of a circular arc. Readings are given in decimals of full capacity, or in fractions; a dial reading in gallons can be had if desired. The larger instruments are calibrated in gallons. It is stated that the method of installation has been so simplified that anyone handy with ordinary tools can properly attach the operating mechanism to the tank and connect it with the dial.

THE IDEAL RADIANT GAS BURNER is the title of a folder describing the equipment manufactured by The Moto-Gas Machine Co., Minneapolis, Minn. This burner is for use with gas, and incor-



The Liquidometer Gives Tankage in Gallons

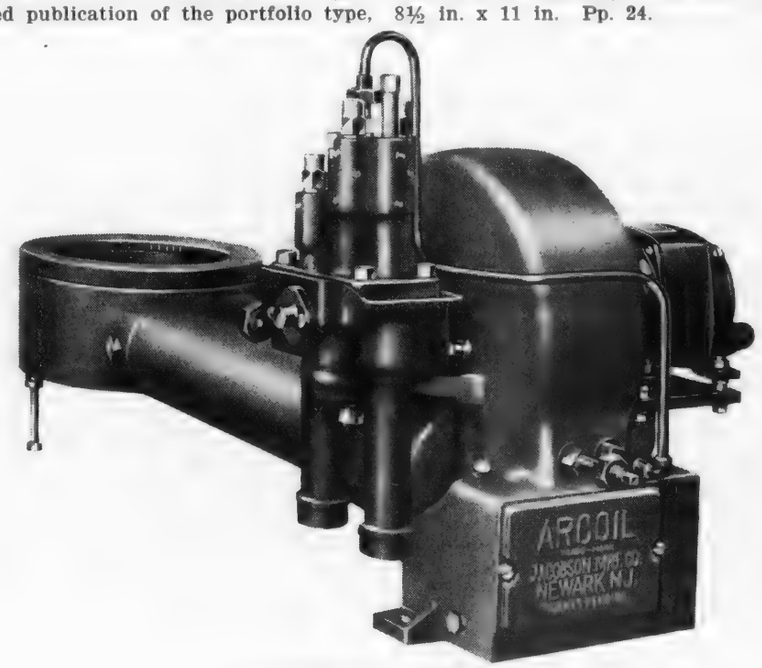


Liquidometer Junior Indicates Tank Contents

porates a special type of burner used with an elaborate group of fire-clay refractories set above the burner. The basic idea is the production of a maximum amount of radiant heat, through the use of these radiant surfaces. The burner is said to be an excellent one for conversion jobs.

THE MOST VALUED FRANCHISE IN THE OIL-BURNER INDUSTRY is the title of an elaborate and exceptionally well-prepared publication of the portfolio type, featuring the Arcoil burner manufactured by the Jacobson Mfg. Co., Newark, N. J. Attention is drawn to the factory facilities, to the financial standing of the company, and to the ability of the engineering talent headed by W. H. Fulton, a graduate engineer. The operating principles, design and construction of the burner are detailed and well illustrated. A comprehensive local sales campaign is outlined and samples are inserted of the direct mail literature prepared for the use of local agents and distributors. A skeleton of a newspaper campaign also is shown, based on which the manufacturer carries a stated amount of advertising through the greater part of the year. The presentation is attractive and the make-up is out of the ordinary. Size 10 in. x 14 in. Pp. 24.

FITZGIBBONS STEEL HEATING BOILERS are featured in Bulletin No. H-7 received from Fitzgibbons Boiler Co., 570 Seventh Ave., New York. As a foreword there are presented some admirable statements in relation to boiler design, taken from a treatise of Kreisinger and Ray of the Bureau of Mines. It is said that the design of the Fitzgibbons boiler closely follows the tenets of these authorities. There also is given an outline of the principles of design incorporated in these boilers, a story of the construction details and the reasons for the adaptability of Fitzgibbons boilers to oil firing. Where this fuel is used, it is stated that outputs greatly in excess of listed ratings can be obtained. The catalog gives essential details of boilers rating from 300 sq. ft. of radiation to 19,000 sq. ft., these being of double electric welded construction. A series of larger units, rating from 4200 sq. ft. to 36,000 sq. ft. has riveted seams. This catalog is an excellent example of straightforward, high-class technical presentation. Size 8½ in. x 11 in. Pp. 24.

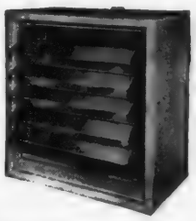


Arcoil Domestic Oil Burner

WING SCRUPLEX FANS are described and illustrated in a bulletin issued by L. J. Wing Mfg. Co., New York, N. Y. This ventilating fan is of the radial-blade type, with constant pitch, the claim of the manufacturers being that this design will insure the movement of a solid cylindrical column of air with substantially equal velocities in all parts of its section. In the smaller sizes the fans are cast in a single unit, of aluminum alloy. In the larger sizes, 30 in. and above, built-up construction is used. This type of fan is built in sizes from 10. in to 60 in. diameter, rated to move from 1100 cu. ft. to 33,000 cu. ft. of free air per minute. Bulletin 68 gives all necessary technical data on this series.

Wing Scruplex Fan

JOHNSON SYSTEM OF TEMPERATURE AND HUMIDITY CONTROL appears on the cover of an unusually attractive and voluminous catalog prepared by Johnson Service Co., Milwaukee, Wis. As stated in the foreword, the book is distributed for three purposes: "To help you appreciate the value and necessity of automatic temperature regulation, to show the part played by the Johnson Service Company in the invention and development of this art, and to describe in detail the various articles made by this company, their functions and their qualities." The fore portion of the book is devoted to a presentation of the necessity for automatic control and, through the reproduction of charts, proof of the efficiency of Johnson equipment. The greater portion of the catalog is devoted to a very complete story of each element in the comprehensive line of devices developed and manufactured by this company. No pains have been spared in the preparation of illustrations and drawings, and the result is almost a treatise on the subject. Size 8½ in. x 11 in. Pp. 80.



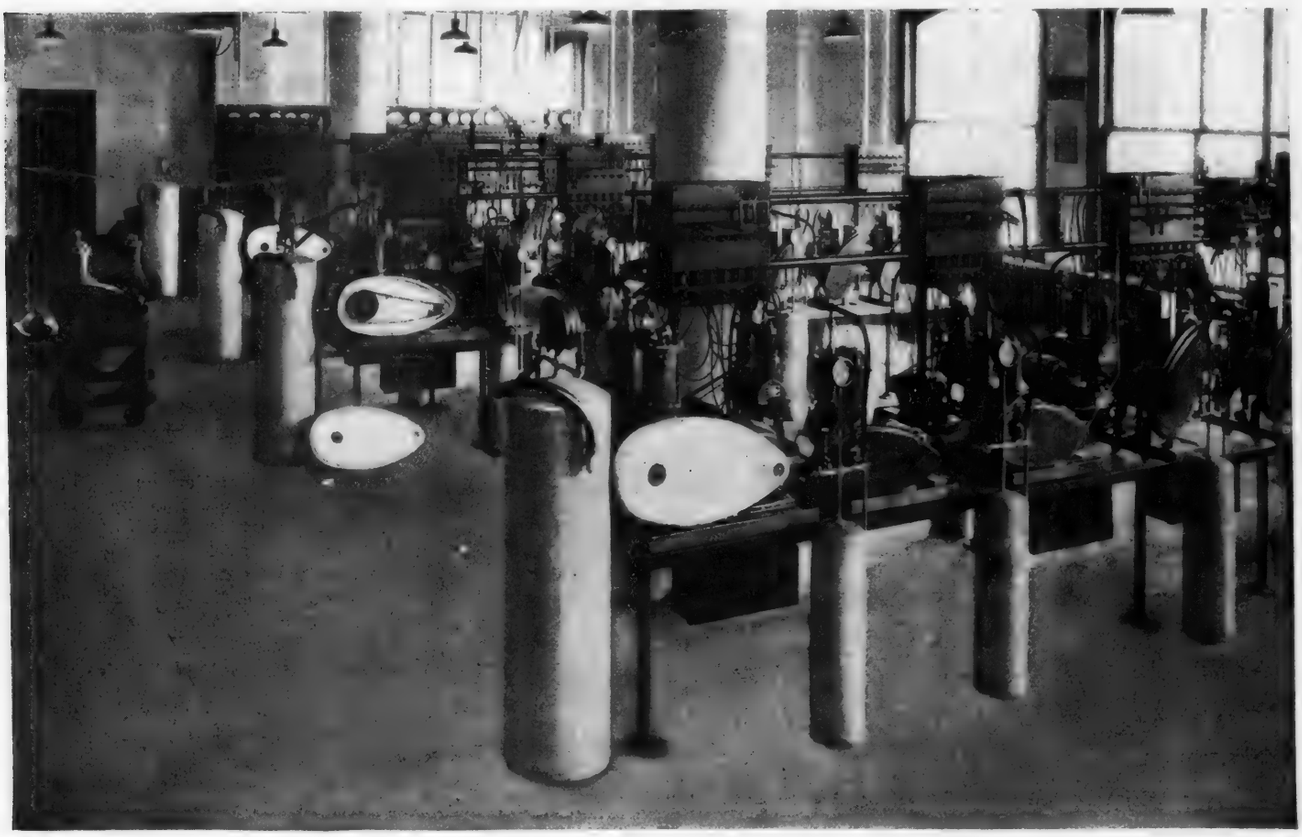
Ilgair Unit, Showing Automatic Shutters

Ilgair Unit for Built-In Construction

VENTILATE YOUR KITCHEN WITH AN ILGAIR ELECTRIC VENTILATOR appears on the cover of a brochure done in color by Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago. Two sizes and two types of these ventilators are available, one with a built-in unit designed to be incorporated in the kitchen wall, and the other, built into a metal panel, is to be inserted in the upper portion of a window. Both are powered with a completely-inclosed self-cooling motor, and the fans are characteristic of Ilg blower equipment. Two sizes are listed, 12-in. and 60-in. diameter, the former recommended for kitchens not exceeding 1500 cu. ft. in volume and the other for larger rooms. Either may be had with a fixed or variable-speed motor.

ELECTROLITES is the title of a publication issued as a house organ by Electrol Inc. of Missouri, St. Louis, Mo. In the November issue, which is No. 3 of Vol. 1, the leading article is a story by F. L. Scott, vice-president of the company, on the beginning of Electrol. In it he describes the development of this well-known domestic burner from a power plant designed for a steam automobile, this evolution paralleling that of the Nokol burner. Another interesting article by G. R. Koeln, national service director, is entitled "What Price Carelessness," and graphically pictures the grief resulting from careless installation.

HIGH PRESSURE is the title of a little house organ published by the Chicago Pump Co., Chicago, and features items of news interest to members of the organization. One of the illustrations shows a section of the warehouse where 1700 pumps are kept in stock.



Test Room Showing Johnson Air Compressors Undergoing Final Test

Oil Burners for Large Low-Pressure Heating Plants

Petro Turbine Burner. *Rotating-Cup Atomizing, Manual Ignition*

6. Petro

Previous articles in this series are:
1. *Todd*, August, 1927.
2. *W. N. Best*, September, 1927.
3. *Ballard*, October, 1927.
4. *Ray*, November, 1927.
5. *Johnson*, December, 1927.

THE "Petro" turbine burner has been designed to meet the special requirements of high-capacity low-pressure heating plants such as are found in the modern hotel, office building and apartment house. Outstanding features of this burner are its wide capacity range, with high efficiency at all ratings; the ability to handle the cheapest grades of fuel oils at low operating pressures and temperatures; and a method for the control of flame shape to accommodate the varied dimensions of fireboxes met in modern boiler practice. It is built by the Petroleum Heat and Power Co., 511 Fifth Avenue, New York.

Application of fuel-oil burners to boilers has occupied the entire interest of this company and its subsidiary organizations since 1903, and the present line of "Petro" burners reflects the experience and progress of this quarter-century of specialized endeavor.

THE GUN

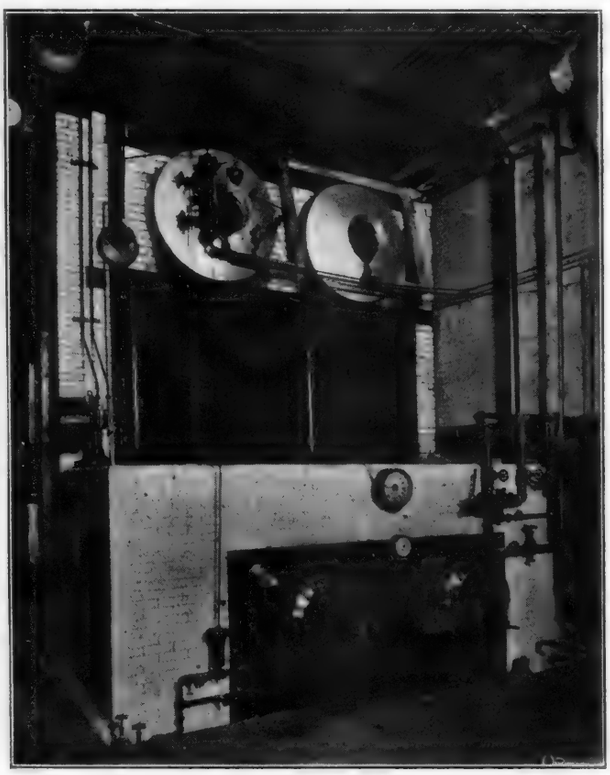
The heart of the burner is the "gun," which consists of a cylindrical tube approximately 3 in. in diameter and 24 in. long, used in conjunction with an air regulating device known as the air register.

The burner contains only one moving part, the air-driven atomizing cup, located at the nozzle end of the gun. A stream of low-pressure primary air from a blower impinges on the cup turbine-wheel, rotating it at speeds approximating 10,000 r.p.m. This high cup speed assures complete atomization.

Fuel is fed to the cup through a stationary hollow fuel-tube. The high rotative speed of the cup causes the oil to fly off its serrated edge in a thin cone-shaped film of finely atomized particles.

After spinning the cup, the primary air stream passes on to the furnace through a set of stationary deflecting vanes at the burner nozzle. These vanes cause the air to whirl in a direction counter to the rotation of the oil cone, thus providing a turbulence that assists in surrounding each oil globule with air. The oil particles, which otherwise would have a tendency to fly off at a tangent, are bent in and away from the furnace walls by the whirling primary air-stream, thus eliminating splashing and spotty fires.

The burner cup rotates on a double set of ball bearings, which are lubricated through an ingenious system of forced lubrication.



Typical Petro High-Pressure Turbine-Burner Installation at Metropolitan Life Insurance Company Building, New York

THE AIR REGISTER

The primary air used to spin the atomizing cup constitutes approximately 20% of the total amount needed for complete combustion of the fuel. The remainder is drawn in by natural draft through an adjustable air damper or register.

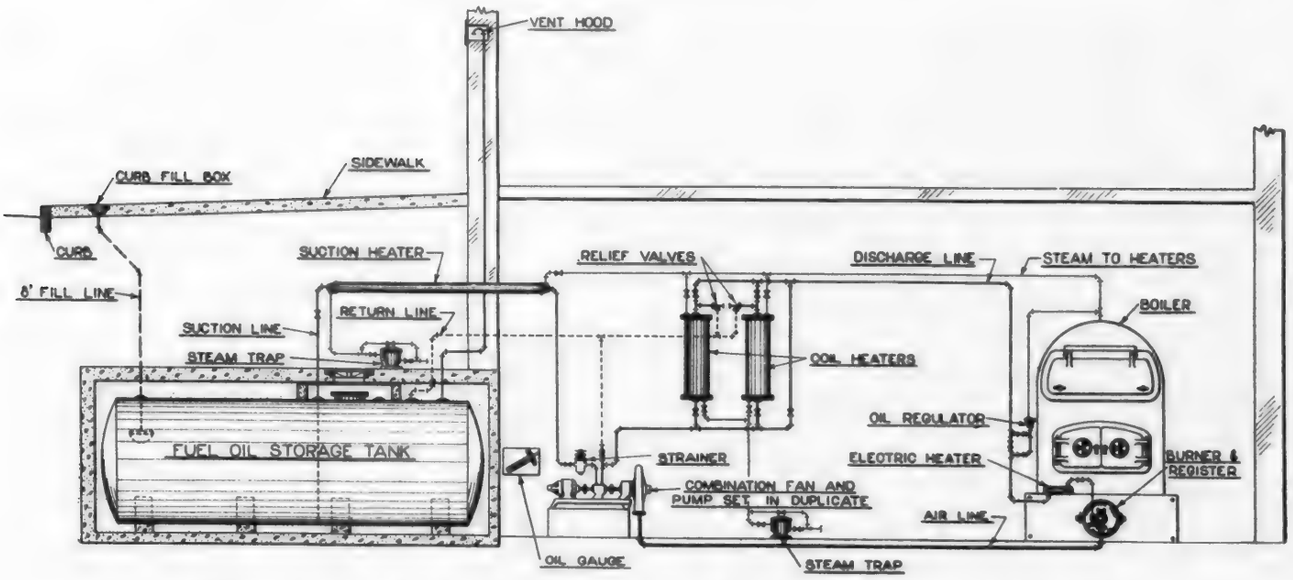
Secondary air is admitted through, and controlled by, a register or damper, consisting of cylindrical casting ranging from 8 in. to 24 in. in diameter, depending upon the capacity of the burner used. It is mounted on a steel plate placed at the front of the boiler, usually at the level of the ashpit door. The burner is held in the axis of the register by a horizontal supporting sleeve, concentric with the register casting. At right angles to the horizontal axis of the burner, between the supporting sleeve and the register body, is a series of radiating movable shutters. These shutters, which when closed overlap one another, are pivoted and adjustable as to their combined net open area, thus providing a means of regulating the amount of air drawn into the furnace. The air so admitted is sufficient for the requirements of the boiler at any given rating. No other draft control is needed.

The register is fixed to the boiler, but the gun proper is removable from the register at will. All burners are interchangeable, thus permitting easy substitution for cleaning.

REGISTER PROVIDES POSITIVE MIXTURE AND FLAME CONTROL

One of the fundamental requisites for the clean combustion of oil is that combustion be complete before any combustible strikes a relatively cold surface. With the variation in the dimensions of the several makes of boilers in common use, it becomes necessary that a burner, suitable for all sizes and shapes of boilers, be provided with means for adjusting its flame shapes to these varying sizes of fireboxes. The "Petro" air register is designed to control the burner flame-shape as required.

By varying the angle of the adjustable shutters, any flame shape desired, from the short broad flame suitable for firebox boilers, and the long narrow flame suitable for horizontally baffled boilers,



Typical Installation of Petro Oil-Burning System, Showing Arrangement of Tank, Pump-and-Fan Set, Strainer, Heaters and Burner

can be obtained at will. The shutters act as flow channels, by which the combustion air is directed across and around the oil stream. This assures a positive mixture of air and oil, cutting down the excess air requirements usually found necessary in the bottom-air-damper type of burner.

Control of the flame shape assures the operator of clean combustion and a clean boiler. Soot, oil drippings and other evils attendant to poor air-and-oil mixture are eliminated with the positive mixing air register.

COMBINATION FAN AND PUMP SETS

Both the oil pump and blower fan are mounted on a single base and combined in a motor-driven unit. The capacities of pump and blower are varied to meet the demands of each installation, so that all the boilers on the job can be fired simultaneously, using only one set. In this way only one motor is required to handle full plant capacity, whether it is carried by one or more than one boiler. An extension of the air and oil lines is all that is required to tie the various boilers on a job into one unified system.

The fan and pump sets need not be placed near the boilers, but can be kept at a distance where the possibilities of motor trouble, due to the radiant heat of the fires, will be entirely eliminated.

Combination fan and pump sets are installed in duplicate. One unit will supply the necessary oil and air to carry the maximum loads on all the boilers while the other is kept in reserve. As complete spare burners are also supplied with each job, there is at all times full protection against plant shut-down due to possible mechanical trouble.

The ease and facility with which the "Petro" equipment can be handled is evident in that it is possible to make a complete change-over of both burners and fan-and-pump sets without interrupting the operation of the boiler plant.

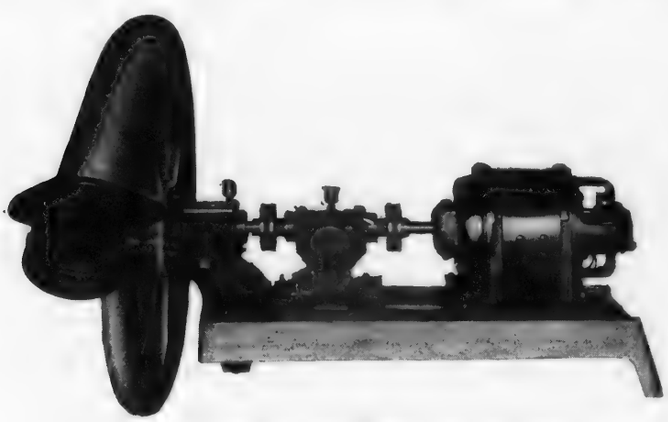
OPERATION OF SYSTEM

A complete fuel-oil burning installation consists of the storage, pumping and atomizing systems. Where the cheap, heavy, viscous fuel oils of 12° A.P.I. and thereabouts are used, a preliminary oil-heating system also is installed. For the intermittently operated plant, which must be started with cold boiler and fuel each day, an electric heater is placed at the burner to raise the heavy oil to the proper temperature for atomization, when starting. The "Petro" oil pumps are designed to pull the oil cold from the tank and deliver it to the burner in that state without the assistance of the usual hot-water circulating system. This tends to simplify the entire installation and make for better operating conditions.

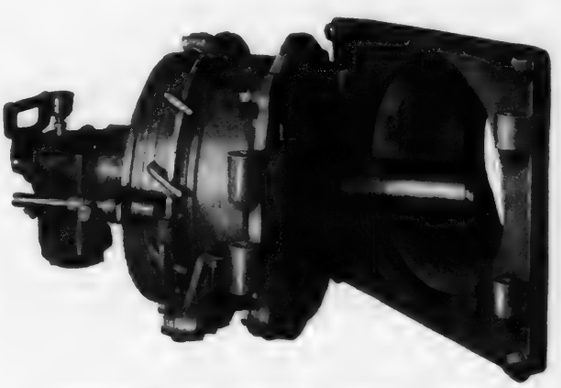
After steam is raised, the suction and discharge steam heaters are used, and the electric heaters at the burners are cut out.

Ignition is manual, and regulators control the flow of oil to the burners to maintain a constant steam pressure. Operating oil-pressure ranges from 5 lbs. to 15 lbs. The heavy oils are kept at 175° F. for best atomization and operation.

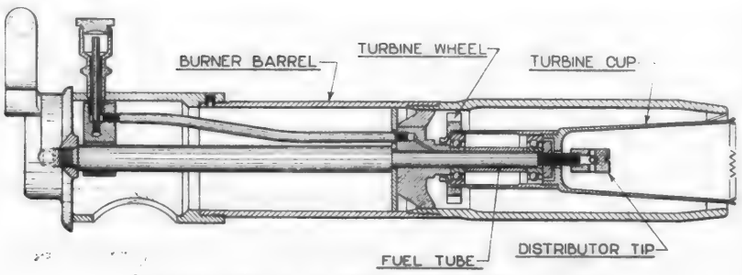
The fireboxes of the boilers are lined with refractory brick in the usual man-



Motor-Driven Fan and Pump Set for Petro Turbine Burner



Burner and Air Register, Partially Opened, Showing Burner Nozzle



Sectional View of Petro Turbine Burner Gun

ner. Particular effort is expended in this phase of the installation, as the secret of the success of many oil-burner installations lies in the correct design of the furnaces.

BURNER SIZES

The entire range of capacity in heating boilers is covered by four combinations of burners and registers.

Size	Capacity		
	Steam Radiation Sq. Ft.	H. P.	Gals. Fuel Per Hour
1-A	3400—7400	25—55	8.3— 18.3
2-A	6750—27,000	50—200	16.6— 66.6
3-A	13,500—40,500	100—300	33.3—100.0
3-B	16,900—50,500	125—375	41.3—125.0

It will be noted that the maximum capacity of each size is approximately three times its minimum.

TYPICAL INSTALLATIONS

While the "Petro" turbine burners were designed originally for the low-pressure heating plant, their great flexibility and simplicity attracted attention of the operators of the largest oil-burning plants in the East, and they now can be seen in operation in scores of the more recently constructed hotels and office buildings in New York, Brooklyn, and Queens. These burners also are replacing the old steam-atomizing burners in the Metropolitan Life Insurance Building and the Ritz Carlton Hotel, which are among the pioneer oil-burning installations in New York City.

All commercial grades of fuel oil from 10° A.P.I. up can be successfully handled by the "Petro" turbine burner.

"Own-Your-Home" Exposition Sponsors Movement for Certification of Houses

A notable plan inaugurated by the Own-Your-Home Building and Equipment Exposition, which goes on at Madison Square Garden, New York, February 21-28, 1928, is the inspection and rating of the so-called speculative type of houses with a view of improving the material and construction methods used in this class of work.

It is the plan of the exposition to procure the co-operation of the U. S. Department of Commerce and representatives of national trade associations with a view of establishing a national certifying service with means for granting certificates in each large city. The personnel of the national service would include representatives from the interested national trade associations, as well as the professional societies. In this movement, certified heat would have a prominent place.

At a meeting of the Heating and Ventilating Committee of the exposition, held at the Transportation Club, Biltmore Hotel, November 2, at which the certification plan was presented, it was pointed out that home-seekers need protection from the shoddy house builder.

At the same meeting, Robert H. Sexton, managing director of the exposition, reported that a plan has been adopted by the National Warm-Air Heating and Ventilating Association of having the exhibits of warm-air furnace manufacturers segregated at the exposition.

As far as exhibits of heating and ventilating products are concerned, it was announced that all applications for space must first have the approval of the A. S. H. & V. E. and the N. W. A. H. & V. A.

Deaths

EDWARD HUBBARD WELLS, chairman of the board of directors of Babcock & Wilcox, of New York, died at his home, in Montclair, N. J., November 17. Mr. Wells was 68 years old, and was born at Dorrville, R. I. During his youth he became interested in the manufacturing of natural gas and engineering in Pittsburgh, and in 1892 he joined the Babcock & Wilcox Company as engineer in charge of sales. In 1898 he was elected president of the company, which position he held until his election in 1906 to the chairmanship of the board of directors. Mr. Wells was also a trustee of the Atlantic Mutual Insurance Company, a director in the North American Company, the Worthington Pump & Machinery Corporation, and the Montclair Trust Company.

CHARLES B. MANVILLE, founder of the Johns-Manville Company and its allied corporations, died at Pleasantville, N. Y., November 26, after a short illness. He was in his ninety-third year. Mr. Manville, who retired from the asbestos industry in 1902, took hold of the fireproof mineral when it was merely a curiosity, discovered uses for it which made possible the huge Johns-Manville concern, and founded the business in Milwaukee, in 1858. Early in his career he experimented with a covering for heat-conveying pipes and at first used a mixture of shoddy and clay. This proved very successful. Later he developed the magnesia covering. In 1900 he established his headquarters in New York and purchased the H. W. Johns Company, a rival in the field, thus obtaining a monopoly of the companies manufacturing insulation of this type.

Mr. Manville and his sons, who are officially connected with the company, obtained virtually the entire supply of raw asbestos on this continent when they gained control of the rich mines in Ontario, the chief sources of the mineral. Each of the three men, as they assumed control of the company, was popularly known as the "asbestos king."

JESSE GOURLEY ANDERSON, president of Barr & Anderson, Vancouver, B. C., died September 21. Mr. Anderson was a native of Gloucester, Mass., and in 1891 his parents moved to Vancouver with their family. Shortly thereafter, as a boy of 16 years of age, he began to learn the heating and plumbing trade. In 1897 he formed the company of Barr & Anderson, the presidency of which he held at the time of his death.

WILLIAM BYRON RUFE, secretary of Jenkins Bros., New York, and a well-known figure in the industry, died in Brooklyn, N. Y., November 27. Mr. Rufe was born in Lehigh County, Pa., 56 years ago. At the age of 16, he obtained employment with Jenkins Brothers as their first stenographer and, in 1907, became secretary of the concern at its incorporation. In January, 1928, Mr. Rufe would have completed 40 years of service. He was also secretary of Jenkins Bros. Ltd., Canadian branch of the company.

H. K. KRIEBEL, originator of the Kriebel system of vapor vacuum heating and a pioneer manufacturer of boilers and heating materials, died December 2. He first became connected with the industry in 1882, and designed the Kriebel system in 1907. Mr. Kriebel was an active member of The Heating and Piping Contractors National Association, and acted as heating engineer for many buildings in and near Philadelphia.

DAVID WILLIAMS, sole owner and publisher of the *Iron Age* from 1868 to 1909, died recently at his home at Lake George, N. Y., at the age of 85.

Mr. Williams was born in Ireland and at the age of 10 years came to the United States with his parents. He graduated from the Middletown Academy in 1857, and had his apprenticeship in the trade journal field with the *Hardwareman* newspaper, of which his father was the publisher. In 1859, the name of his journal was changed to the *Iron Age*, and in 1868, Mr. Williams assumed complete control of this publication. Mr. Williams was a charter member of the Engineers Club and a member of the American Institute of Mining Engineers.

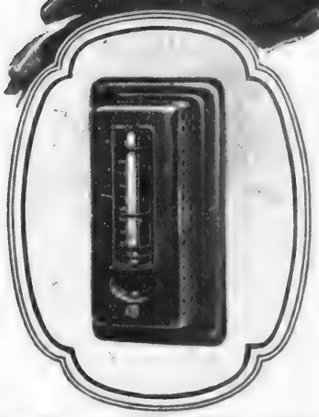
DEXTER HORTON NATIONAL BANK BUILDING
SEATTLE, WASHINGTON

Architect: John Graham, Seattle
Consulting Engineer and Heating Contractor: Hugh Phelps, Seattle
Building Manager: Charles E. Horton

Powers Control
Costs Less in the Long Run

Annual bills for repairs and adjustments of temperature control will have no place in the budget of the Dexter Horton National Bank, of Seattle. Architect, Consulting Engineer, and Building Manager joined in eliminating that needless expense. They installed the POWERS system of Automatic Temperature Control. Realizing that "first cost" is only a relative factor, they figured the "upkeep" as well, for experience shows that the POWERS trouble-free system insures from 20 to 30 years of accurate and dependable control, without the need of frequent adjustment or the constant expense of "service".

For convincing evidence to support the above claims, read our book, "The Elimination of Heat Waste". Sent free on request.



The Powers VAPOR DISC Thermostat

This remarkable thermostat gives *absolute* graduated control, uses but 10% of the compressed air required by other systems. Good for 20 to 30 years of *accurate, dependable* control, without frequent repairs or adjustments.

THE POWERS REGULATOR CO.

36 years of specialization in temperature control

2718 Greenview Avenue, Chicago

Atlanta	Cincinnati	El Paso	Los Angeles	New Orleans	Rochester	CANADIAN OFFICES:
Baltimore	Cleveland	Hartford, Conn.	Louisville	New York	St. Louis	
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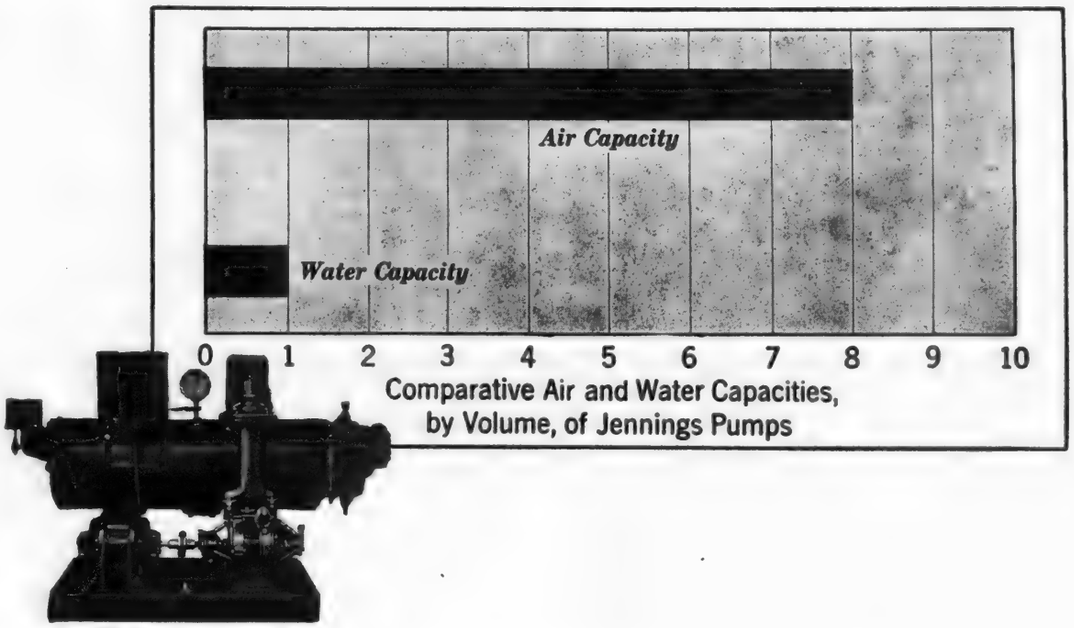
Charlotte, N. C.						(3844A)



Comparative Air and Water Capacities, by Volume, of Jennings Pumps

Liberal air capacity

Jennings Return Line Vacuum Heating Pumps have an air capacity that by volume is eight times the condensate to be handled.

Such air capacity will be found liberal. For tight, well-designed systems it is more than ample.

When equipped with automatic control, the Jennings Pump is in operation only for short periods at a time. Here, liberal air capacity results in a substantial saving in power.

NASH ENGINEERING COMPANY

81 Wilson Road **SO. NORWALK, CONN.**

Branch Sales Offices: Atlanta, Birmingham, Boston, Buffalo, Chattanooga, Chicago, Cleveland, Dallas, Denver, Detroit, Indianapolis, Kansas City, Los Angeles, Louisville, Memphis, Miami, Minneapolis, New Orleans, New York, Omaha, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Tampa, Washington, D. C. **In Canada:** Montreal, Toronto and Vancouver. **European Offices:** London, Eng., Norman Eng. Co.; Brussels, Belgium, and Amsterdam, Holland, Louis Reijners & Co.; Oslo, Norway, and Stockholm, Sweden, Lorentzen & Wettre.

Jennings Pumps

Trade and Miscellaneous Notes

Coming Events

January 23-26, 1928. Annual meeting of the American Society of Heating and Ventilating Engineers in New York. Headquarters at the Hotel Pennsylvania.

January 23-27, 1928. Ninth annual convention of the Associated General Contractors of America in West Baden, Ind. Headquarters at the West Baden Springs Hotel.

February 14-16, 1928. Annual general professional meeting of the Engineering Institute of Canada in Montreal.

February 14-18, 1928. Midwestern Engineering and Power Exposition in the Coliseum, Chicago.

February 21-28, 1928. Tenth annual "Own-Your-Home" Building and Equipment Exposition in New York. Headquarters at Madison Square Garden.

March 31-April 7, 1928. Eighth annual "Own-Your-Home" Building and Equipment Exposition in Chicago. Headquarters at the Coliseum.

April 3-5, 1928. Fifth annual convention of the American Oil Burner Association in Chicago. Headquarters at the Stevens Hotel.

April 17-19, 1928. Annual convention of the National Warm-Air Heating and Ventilating Association in Chicago. Headquarters at the Stevens Hotel.

Miscellaneous Notes

November building operations, reported by the F. W. Dodge Corporation, show a drop of 17% from the total for October of this year, but only 4% from the November, 1926, record. The figures for 37 States east of the Rocky Mountains, were $466,393,400. Analysis of the November building record showed that 46% of all construction was for residential buildings, 16% for public works and utilities, 11% for industrial projects, and 9% for commercial buildings. In New York State and Northern New Jersey, contracts amounted to $129,313,800. This figure was the second largest November contract total on record for this district. In the New England States, the construction contracts amounted to $43,237,800, being the highest November contract total ever recorded in this territory. A drop of 28% below the November, 1926, record was reported from the Middle Atlantic States. In the Pittsburgh district the figures show an increase of 4% over the November, 1926, total. The principal loss in construction activities was reported in the Central West where the total construction fell 53% below the October, 1927, record and 21% below the amount reported in November of last year. In the Northwest also the figures represented a loss of 30% from October of this year, and a loss of 6% from November of last year. Satisfactory increases were reported from the Southeastern States, while Texas increased its building operations 68% over October, 1927, and 72% over November, 1926.

International Acetylene Association at its meeting in Chicago, in November, awarded the Morehead gold medal to the Underwriters' Laboratories, Inc. This award is made for exceptionally meritorious service in the production and utilization of calcium carbide and acetylene.

Prof. A. C. Willard, of the University of Illinois, has been retained by the United States Department of Health and the United States Treasury Department as consulting engineer in connection with the heating and ventilation of the United States Capitol in Washington, D. C.

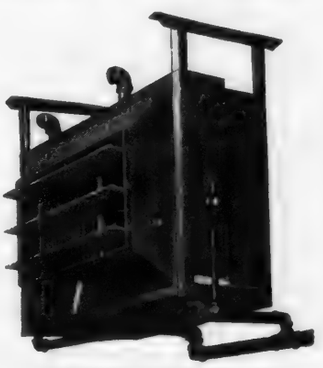
BUILT—*for Years of Service!*

SPECIFICATIONS

Motor: Autovent Heavy-Duty type; radiation cooled, 40° type motor not in path of heated air.
Fan Wheel: Blades No. 14 gauge iron. Rigid construction.
Casing: Heavy construction, sheet steel securely braced and riveted.
Coil: Optional; either high and low pressure copper fin-type tubing or Vento cast iron furnished.

THE above general specifications tell why Autovent Unit Heaters give such excellent service. Every heater is built to withstand years and years of the hardest kind of usage. And note this fact. In the four years that we have been building Autovent Unit Heaters not one has ever been reported unsatisfactory.

Now, consider the added *exclusive* Autovent features of design such as *tapered discharge opening* and extra large *pressure chamber.* These additional refinements guarantee the customer satisfaction!



AUTOVENT UNIT HEATER
Ceiling Type

AUTOVENT UNIT HEATERS

Guaranteed

The American Wood Carving Company, Chicago, says:
We are so very much pleased and satisfied with your Autovent Unit Heater Equipment, that there are no words which could express how much we appreciate these heaters.

Write for full data

Manufactured and Guaranteed by

Autovent Fan & Blower Co.

1805-27 No. Kostner Ave. CHICAGO

Fourth Annual Conference for Training Plumbing and Heating Instructors is being held in Pittsburgh, Pa., January 9-20. This conference is planned especially for those preparing to teach plumbing and steamfitting apprentices or helpers.

Herman N. Bundesen, M.D., until recently commissioner of health of Chicago, has been elected president of the American Public Health Association. Doctor Bundesen was appointed commissioner of health of Chicago in 1922, and served through three administrations.

Mrs. Olive E. Frank, owner-manager of the O. E. Frank Heater and Engineering Co., Buffalo, N. Y., was the subject of an article on the woman's page of the New York Sun, for December 12. Mrs. Frank's rise in the heating field, from her development of a U-tube storage heater to the launching of her own company for the manufacture of storage heaters of various types, is told in an interesting manner and is supplemented by a likeness of Mrs. Frank. Mrs. Frank is one of the two women members of the American Society of Heating and Ventilating Engineers, and also a member of the American Society of Mechanical Engineers.

Pipe Nipple Standards Corp., Chicago, Ill., has been formed by Julian Armstrong to promote better conditions in the industry through co-operative methods. The company is a non-profit corporation with an Illinois charter. An outstanding feature of its plan is through associate membership at a small cost for buyers of pipe nipples whereby they will secure all the benefits extended to active members, the producers of pipe nipples.

Standards of quality for pipe nipples and registered trademarks for identification are included in the plan. Offices will be maintained at 400 North Michigan Ave., Chicago. President, Raymond Groff; vice-president, Frank M. Wiedeman; executive vice-president, Julian Armstrong; secretary, D. W. Howe; treasurer, William J. Walther.

Frost Research Laboratory, Inc., The Curren Arcade, Norristown, Pa., in a circular of Christmas greetings, announces that the laboratory will shortly be established in new quarters with greatly-enlarged testing equipment. Facilities will be provided for conducting tests of eight boilers simultaneously. The radiator testing rooms and apparatus, it is added, will be unexcelled.

American Engineering Standards Committee, through its executive committee, has referred the subject of standardizing valves to a Sectional Committee on the Standardization of Pipe Flanges and Fittings. This Sectional Committee was formed several years ago under the joint sponsorship of the A.S.M.E., the Manufacturers Standardization Society of the Valve and Fittings Industry, and the Heating and Piping Contractors National Association. The committee has one completed standard to its credit and three others ready for final action.

William F. Stearns, general sales manager of the Landon Radiator Co., North Tonawanda, N. Y., who had a painful injury recently in an automobile accident, is recovering rapidly and anticipates being back at his desk within a short time. Mr. Stearns had two of his ribs broken.

Chicago, Ill.—Dr. Arnold J. Kegel has been appointed health commissioner to fill the position left vacant by the resignation of Dr. Herman N. Bundesen.

Manufacturers' Notes

Bryan Steam Corp., Peru, Ind., has established an office and warehouse distribution for the New York district, to be operated as the Bryan Boiler Co., at 405 Greenwich Ave., Greenwich, Conn.

American Metal Products Corp., St. Louis, Mo., has purchased a modern factory building, 50 ft. x 300 ft., situated on the Wabash Railroad at Goodfellow Avenue. The building is of the modern "daylight" type. Preparations are under way for an addition to house the general offices of the company. This company, which manufactures Kaufmann radiator shields, is located at 5857 Manchester Avenue, but it is expected that removal will be made early in 1928.

OIL BURNER GULF COMPANY

Three Profitable Years

of good selling, and of excellent performance in all types of heating plants, proves the fundamental soundness of handling an Oil Burner that has behind it the engineering knowledge, manufacturing skill and merchandising ability of The Gulf Organization.

A valuable franchise, including unusual cooperation and sales helps, is available to dealers whose qualifications meet our requirements.

Write now for full details.

The Gulf Oil Burner Co.

Dept. D-1, 1627 Chestnut Street, Philadelphia, Pa.

Sylphon TRADE MARK Damper Regulators

these facts deserve your attention—

Lifelong, dependable, automatic damper control with resultant economies—whether the system be hot water, steam or vapor,

—that's the reason Sylphon Damper Regulators are found as standard equipment on most of the leading makes of boilers.

Sylphon Damper Regulators can also be quickly and easily installed on old heating boilers, with the same degree of heating satisfaction and economy of fuel consumption.

The smooth, continuous operation of dampers, sensitive to the slightest change of temperature, is guaranteed by the exclusively patented diaphragm of every Sylphon Regulator —the Sylphon Bellows. This bellows is recognized by engineers as the most durable, sensitive expansion unit known.

Ask for Bulletin WDR-8.

The Fulton Sylphon Company

Originators and Patentees of the Sylphon Bellows

Knoxville, Tennessee, U.S.A.

Sales Offices in: New York, Chicago, Detroit, Boston, Philadelphia and all principal cities in U. S. European Representatives: Crosby Valve & Engineering Co., Ltd., 41-42 Foley St., London, W. 1, England. Canadian Representatives: Darling Brothers, Ltd., 120 Prince St., Montreal, Quebec.

Your Guarantee The SYLPHON BELLOWS

A Standard All Along the Line

No. 45-A for hot water boilers.

No. 46 for domestic hot water supply heaters.

No. 22-J for steam boilers.

No. 22 for steam boilers.

Belknap Mfg. Co., Bridgeport, Conn., manufacturer of radiator valves for steam and hot water and gate and globe valves, has appointed Stephen P. Hackley as sales manager. Mr. Hackley, for the past five years, has been sales manager of the building supplies division of the Bridgeport Brass Company.

C. A. Dunham Co., Chicago, Ill., has appointed John Sterling, formerly in the Chicago office, as manager of the Cleveland branch sales office, with headquarters in the Union Trust Building. The resignation of Preston Daniels as manager of the Des Moines branch sales office has been announced. Mr. Daniels became connected with the company in 1910, and in 1911 he was made chief heating engineer at Marshalltown, relinquishing that work to take charge of the Des Moines office in 1912. Daniel C. Murphy has been appointed the new manager of the Des Moines branch sales office, being formerly in the Davenport branch. James R. McCue, who has been in charge of sales and promotional work of the Dunhameter Corporation, has been assigned to special sales work in the Cleveland territory, and will have his headquarters in the Cleveland office. B. R. Hawley is in charge of the Omaha sales office and recently has established quarters in the Peters Trust Building.

Ilg Electric Ventilating Co., Chicago, Ill., has broken ground for a two-story addition to its plant which will add 15,000 sq. ft. to present production facilities. The Ilg plant is located on a tract of several acres and the new wing will add a square building which extends the length of one end of the property and has a depth of 200 ft.

National Radiator Corp., Johnstown, Pa., has appointed James J. Mason, formerly with the Herman Nelson Corporation and the Utica Heater Company, as architectural and engineering representative in the Cleveland territory. Another appointment is that of D. H. Cuyler, formerly manager of the Chicago branch of the National Radiator Company, as manager of the Cincinnati branch of the new corporation.

Pyramid Iron Products Corp., 136 Liberty St., New York, reports orders to equip three boilers in the plant of the Brooklyn Daily Eagle and two boilers in the plant of the Ward Baking Co., Brooklyn, with Pyramid grates and forced draft equipment. Other orders are reported from Grob and Knobel, New York, American Smelting and Refining Co., for Peru, S. A., and the Northern States Power Co., Grand Forks, N. D.

Staten Island Shipbuilding Co., Mariners Harbor, Staten Island, N. Y., has acquired the Ames Pump Division of the W. N. Best Corp., of New York, which will be known as the Ames Pump Company, Inc., Division of the Staten Island Shipbuilding Company, with offices at 90 West St., New York.

William J. Davidson, president of the company, is chairman of the board of directors of the new division. The following officers also constitute the board of directors: President, George T. Jacocks, president and general manager of the recently-formed Heat Transfer Products Division of the company; vice-president and general manager, Charles F. Ames; vice-president in charge of engineering, R. H. Frederich; secretary, A. H. E. Berchem, all formerly a part of the Ames Pump Company; treasurer, George H. Bates, and assistant treasurer, Harold Williams. Representatives will be placed in all key cities of the United States.

Gorton Heating Corp., 96 Liberty St., New York, is the new name of the Gorton & Lidgerwood Company, manufacturer of Gorton heating equipment. This change, it is stated, will not affect the business in any way, the management and personnel remaining the same. The new name, it is felt, more clearly indicates the nature of the company's business. There also will be no change in the general offices of the corporation, which will remain at 96 Liberty Street where the company has been located since 1887.

Cornell Utilities Co., 103 Park Ave., New York, Nokol, dealers, has acquired the Aetna representation east of the Hudson River which formerly was held by the Frank A. Holby Corporation. General offices of the company have been moved to 4 East 39th Street, which will be known as the Cornell Utilities Building.

Seamless Copper and Brass Tubing---In Stock

Quick Shipment of Standard Sizes or Specials.
Write for "In Stock" List.

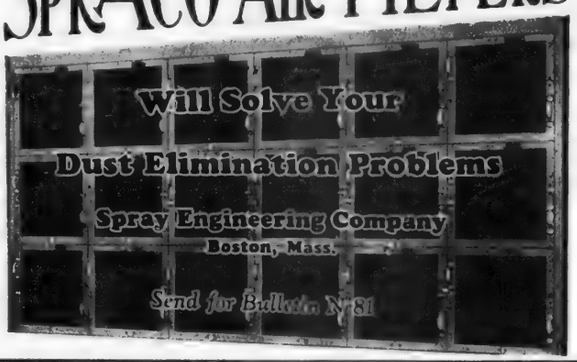
WOLVERINE TUBE COMPANY

1415 Central Avenue Detroit, Michigan

Chicago, Ill. 129 S. Jefferson St.
Cleveland, Ohio 602 Hunkin-Conkey Bldg.
Rochester, N. Y. 206 Central Trust Bldg.

WOLVERINE
SEAMLESS COPPER AND BRASS TUBING

SPRACO AIR FILTERS



SEE OUR DETAILED DATA IN ASH & VE GUIDE

SEE OUR DETAILED DATA IN ASH & VE GUIDE

Boston Cleveland Chicago New York Philadelphia Los Angeles Kansas City

Jim: (who thinks all fittings are a gamble): "We've got to hurry to hook this line up by five o'clock. Hope we don't run into a lot of crooked threads."

Old Timer: "Don't worry! See the big 'G.'? Grinnell made these fittings."

The Old Timer Knows

Straight tapping is one of many reasons why Grinnell Cast Iron Fittings mean better jobs with less labor. Grinnell Fittings make a straight, tight joint—without forcing. Insure perfect alignment. And cut down the delays and replacements resulting from sandholes. Try out these time-saving, labor-saving fittings. Write us for the name of the nearest distributor if your own jobber doesn't carry them. Address Grinnell Company, Inc., 208 W. Exchange St., Providence, R. I.

GRINNELL
PIPE FITTINGS

Cast Iron Fittings—Adjustable Pipe Hangers

GRINNELL

Pipe Bends—Welded Headers—Lap Joints—Piping Supplies

Sales Convention, Eastern Division, Reed Air Filter Company

Reed Air Filter Co., Louisville, Ky., held an eastern division sales convention, November 28-29, when 38 representatives from east of the Mississippi River attended the two-day session, which was devoted to air filters, both the Reed Streamline automatic and unit types; Circulair heat, the new convection heating unit soon to be placed on the market by the company.

Absolute Con-Tac-Tor Corp., Elkhart, Ind., announces the purchase of the electrical control business of McDonnell and Miller, of Chicago. The purchase includes the No. 131 duplex switch, No. 132 vapor switch, and No. 133 low water cut-off. McDonnell and Miller will continue to manufacture its non-electrical duplex water feeder.

Preferred Oil Burners, Inc., is the legal title of the organization that has been evolved from the W. B. Wilde Co., Peoria, Ill., manufacturers of the Hart oil burner. The burner will be known as the Preferred oil burner. The control of the new organization almost entirely is lodged in a group of oil-burner distributors, headed by A. E. MacInnis, of Seattle; R. S. Bohn, of New York; and Spencer A. Merrell, of St. Louis. Outlining the policy of the new organization, Mr. MacInnis said:

"Preferred Oil Burners, Inc., will be managed by a group of stockholding distributors and dealers. Recognizing the error in attempting to apply automobile trade policies to the oil-burner business they will follow an opposite course. List prices of Hart burners will be reduced. Discounts will be increased. The dealer contract limits the purchases of the dealer to his current requirements, thus eliminating the expense of carrying heavy stocks. This will curtail the factory profits," said Mr. MacInnis, "but as the stockholders are themselves dealers, they will make more money each year. Dealers who are not stockholders will benefit by the policies as all dealers and distributors will get the same discounts according to their volume of business."

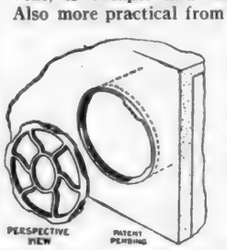
O. E. Frank Heater & Engineering Co., Buffalo, N. Y., announces that C. K. Bennett, of Tulsa, Okla., has joined its organization. Mr. Bennett was connected with the Schutte & Koerting Company.

for gallery risers

USE

Round shaped Vents

Write for convincing proof that DISC-LOC, the round shaped vent, is cheaper and easier to install than oblong step grills. Also more practical from the standpoint of structural strength.



Used by the Newest Theatres in many cities. Architects favor DISC-LOC vents whenever they have been tried. Made with or without dampers.

KNOWLES MUSHROOM VENTILATOR CO.

202 Franklin St., NEW YORK

E Z

RADIATOR HANGER

You can always get prompt shipments of E-Z Hangers for **ALL tube-type radiators.** Baseboard adjustment if desired. Use this strong, simple, one-bolt hanger.

Healy-Ruff Co.

772 Hampden Ave.

St. Paul, Minn.

Fifty Years' Experience behind this heater—

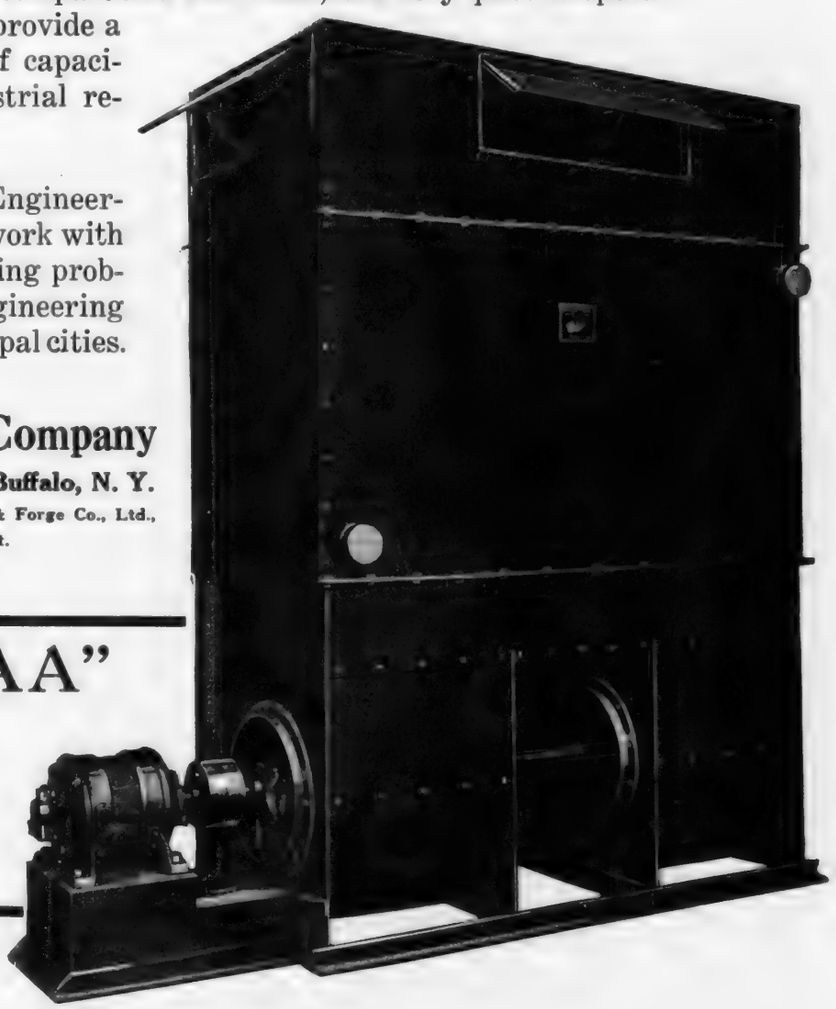
Higher efficiency, lower cost, simpler construction and easier installation are the four "high spots" in the improved Buffalo Type "AA" Unit Heater developed from fifty years' experience in air handling and heating.

Suitable for unusually high steam pressures, the Units are of the recirculating floor-type, taking in air near the floor line which is heated and delivered at comparatively high velocity above the working zone.

The heating coils are made from ½" steel pipe, specially formed and assembled in staggered rows between extra heavy steel headers.

The whole unit is compact and well made, and very quiet in operation. Five sizes provide a desirable range of capacities for all industrial requirements.

Let our capable Engineering Department work with you on your heating problems. Branch Engineering offices in all principal cities.



Buffalo Forge Company

480 Broadway Buffalo, N. Y.

In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" Type "AA" Unit Heaters

for HIGH Steam Pressures.

Lincoln Electric Co., Cleveland, O., announces the transfer of E. F. Hoff from the Cleveland welder division to the same division at New York, where he will be in charge of welder service under the direction of G. N. Bull, district manager.

Merger

Grabler Mfg. Co., Cleveland, O., manufacturer of square "G" products, and the Republic Brass Co., of Cleveland, have merged their interests. The distribution of square "G" products and Republic brass goods will be handled by a subsidiary of the Grabler and Republic companies, under the name of Grabler-Republic Inc. This subsidiary company will be personally supervised by E. H. Blywise, who is well-known through the heating and plumbing industry.

Changes of Address

John J. Nesbitt, Inc., announces the removal of its New York office to 11 Park Place.

Bailey Meter Co., Cleveland, O., announces the removal of its main office and works from 2015 East 46th Street, to the new plant at 1050 Ivanhoe Road.

M. C. Gillett, 6600 Rising Sun Ave., Philadelphia, Pa., announces his resignation as sales engineer of the Spencer Heater Co., Williamsport, Pa., after an association of 27 years with this company.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

HEATING ENGINEER WANTED—Manufacturer of established line of warm-air heating apparatus wants experienced heating engineer to design, estimate and supervise installation of furnace fan blast heating systems for various types of buildings. Give full particulars in first letter. Address Box 11, care of Heating and Ventilating Magazine.

POSITION WANTED—Boiler and radiator salesman who has produced desires to represent a manufacturer in the state of Michigan on a commission basis, or as a manufacturer's agent. Will consider anything in the heating line. Address Box 12, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of cabinet radiation, cores and unit heaters, desires recognized representatives on commission basis. Address Box 13, care of Heating and Ventilating Magazine.

MANUFACTURER'S REPRESENTATIVE—Manufacturer of complete line of fans, air washers and unit heaters, desires recognized representatives on commission basis. Address Box 14, care of Heating and Ventilating Magazine.

ENGINEER WANTED—Production engineer required for small works in England manufacturing vapor and gas actuated controllers, recorders and other thermostatic appliances. Experience with first class American firm in similar line essential. Applications stating age, experience and salary required. Address Box 15, care of Heating and Ventilating Magazine.

THE MAN WHO KNOWS IS THE MAN WHO WINS

And you'll always find that the Technically Trained man is the winner!

The course mapped out for you by the St. Louis Technical Institute is one that leads to quick and sure success, because no essential point is overlooked. Lessons are easy to grasp because they are based on natural progress. Become a foreman! Own your own shop! We can show you how! Your income can increase from three times on with your own application to our method of training! Let us send you full information on any of the following:

- ☐ Heating and Ventilating Engineering.
- ☐ Special Steam and Water Heating.
- ☐ Plumbing Design and Installation.
- ☐ Warm Air Heating.
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Est. 1910

The most thorough institution for Technical Home Study to-day.

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Be Sure You Know ALL about the ACE Automatic; Self-Cleaning AIR FILTER

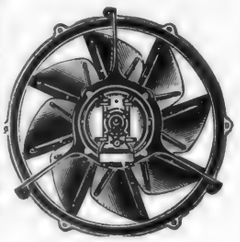
before buying or specifying air cleaning equipment. ACE advantages warrant it, —for either the large or the small job. Learn why ACE is more efficient; more economical; how operation is completely automatic, even to expulsion of dirt from filter tank; how all ugly manual cleaning is eliminated, insuring unimpaired efficiency throughout service life.

Write for full details

General Air Filters Corp.
Division The W. B. Connor Co. Inc.
367 Lexington Ave., New York.

JAMES M. SEYMOUR
Established 1888
Lawrence St., Mechanic St. and Kirk Place, NEWARK, NEW JERSEY

AUDITORIUM FANS, 36" to 120" to fit any square opening. SEYMOUR FANS sold subject to substantial discount. Furnished with suitable pulley or coupling for direct connection TWIN FANS include shafting and center bearing.



Special Fans for Cooling Towers, Heating Systems, Induced Draft, Forced Draft, Dry Rooms, Dry Kilns.

SEND for BULLETINS, PRICES, and DISCOUNTS

KAUFFMAN

AIR DIFFUSERS

SINCE 1908
Kauffman Air Diffusers
HAVE BEEN IN USE IN
Some of America's Finest Theatres
Simple to Install—Low in Price
Graduated Air Control

AMERICAN METAL PRODUCTS CORP.
ST. LOUIS, U. S. A.

Don't Overlook these Ratings on Heating Equipment

HEAT WITH UNIT HEATERS

UNIT	DIMENSIONS	WEIGHT	CAPACITY IN CUBIC FEET OF HEATED AIR PER MINUTE	SQUARE FEET OF DIRECT RAD. REQUIRED TO GIVE SAME CAPACITY
Venturafin No. 2A	22¾" high 14⅜" wide 12⅞" deep	60 lbs.	450 cu. ft. per minute	125 square feet
Venturafin No. 2B	22¾" high 14⅜" wide 12⅞" deep	70 lbs.	675 cu. ft. per minute	165 square feet
Venturafin No. 2C	22¾" high 14⅜" wide 12⅞" deep	80 lbs.	900 cu. ft. per minute	200 square feet
Venturafin No. 4	29" high 32" wide 10 1/6" deep	350 lbs.	2000 cu. ft. per minute	500 square feet
Venturafin No. 7	58" high 56½" wide 13⅛" deep	1100 lbs.	8000 cu. ft. per minute	2000 square feet

VENTURAFIN Heating Units have more than 5 times the efficiency of an equivalent amount of radiators, wall coils, etc.

A Venturafin Unit for a given capacity occupies only ¼ of the space and weighs only $\frac{1}{10}$ as much as the necessary amount of direct radiation for the same capacity.

Consequently Venturafin is easier and cheaper to install and handle.

There is a Venturafin Unit for practically every heating need—stores, offices, garages, salesrooms, lodge halls, auditoriums, factories, shops, etc.

Thousands of Venturafin Units are daily establishing new records of heating economy and heating efficiency.

Mail this coupon today for all the facts

COUPON

AMERICAN BLOWER CO.
6004 Russell St.
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Send details relative to the application of the Venturafin Method of Unit Heating to

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AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
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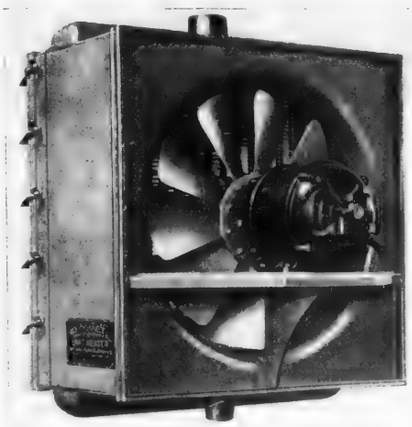
American Blower (699)
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
Manufacturers of all Types of Air-Handling Equipment — Since 1881

COMET
UNIT-HEATERS



Built Strong as a Power Boiler and Guaranteed to Withstand Unlimited Steam Pressure!

AIRBOUND pounding, water logging, or freezing will not affect the Comet Unit Heater with its sturdy, welded construction, as the core contains no cast, soldered or brazed materials. Every one is tested under hydrostatic pressure and guaranteed to withstand unlimited steam pressure.

Comet Unit Heaters will also resist rust, corrosion and oxidation for the LIFETIME OF THE ENTIRE HEATING SYSTEM.

Comet Unit Heaters are furnished in either overhead or floor mounted types and are easily installed.

Write for descriptive literature giving guaranteed capacities.

Fans
Unit Heaters
Air Washers
Blowers
Furnaces

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View of Bottom Casting

Nu-Notch
REG. U.S. PAT. OFF.

THE
Mushroom Ventilator You Can Depend Upon
FOR ANY KIND OF FLOOR

"Nu-Notch" can be installed complete just before the seats are placed, thus doing away with breakage. Attached to

Wood Floors by 3 lag screws in flange countersunk holes.

Concrete Floors by 3 L lugs bolted to floor flange.

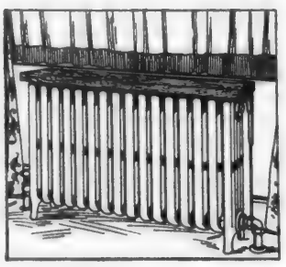
Monolithic or similar type of floors, by 3 set screws securing the collar to the sleeve.

"Nu-Notch" is specified by leading architects and engineers. Send for details.

Knowles Mushroom Ventilator Co.
202 Franklin Street NEW YORK CITY

Heating Contractors

Your Sales are Limited only by the Number of Radiator Installations.



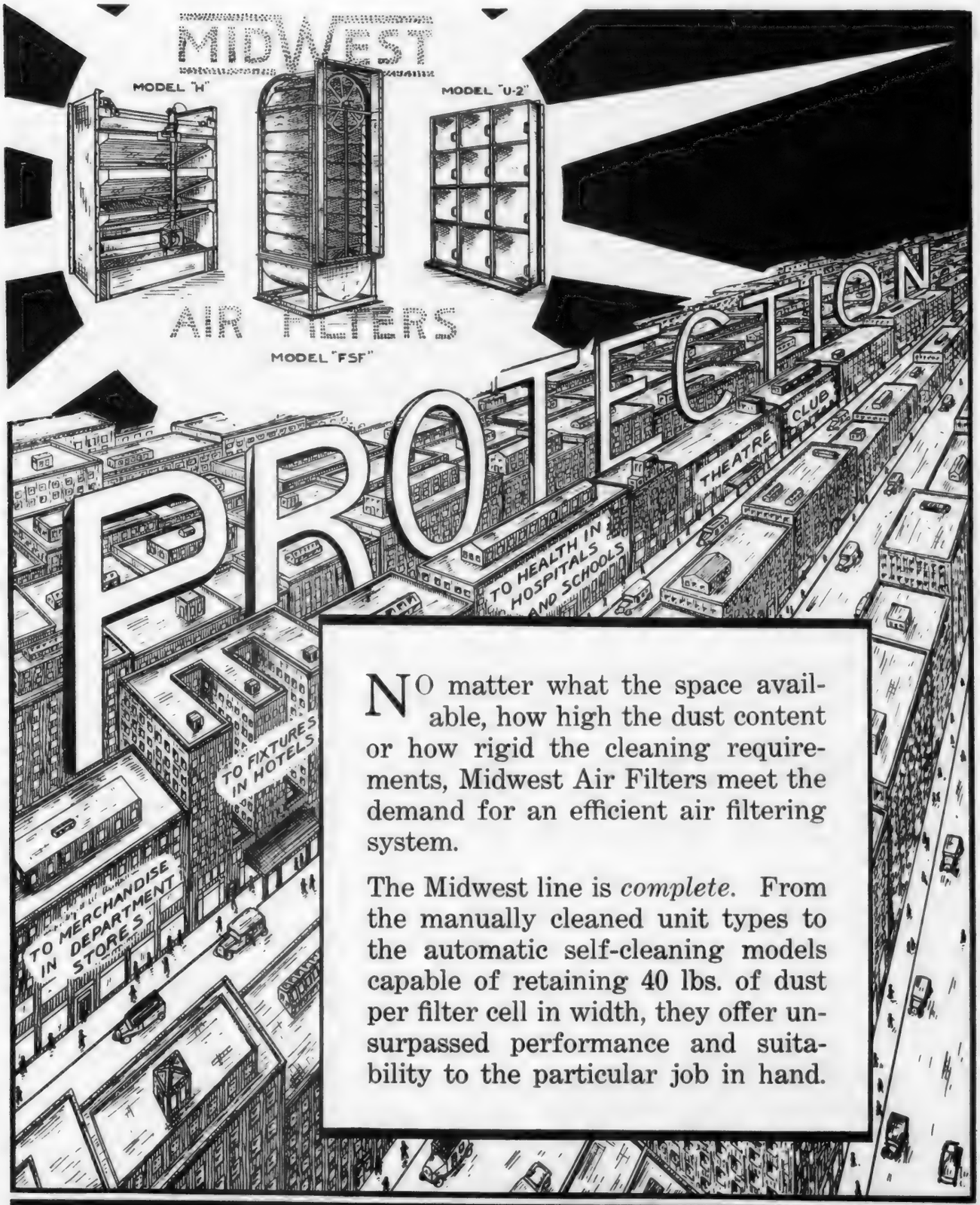
We Want Dealers

Every radiator installation is a ready and almost certain prospect for the sale of our Shields or Cabinets. You can do a big business by installing our Baked Enamel Shields and Art De Luxe Cabinets.

Proper construction permits ready circulation of both cold and hot air. Our product is made by men who are thoroughly familiar with heating and ventilating requirements. Architects are continually recommending the Acme Line.

Write for Prices and Dealer Agreement.

Acme Radiator Shield Co., Inc.
Manufacturers of "Modern" Radiator Furniture.
48 and 50 Vine Street, Cincinnati, Ohio.



NO matter what the space available, how high the dust content or how rigid the cleaning requirements, Midwest Air Filters meet the demand for an efficient air filtering system.

The Midwest line is *complete.* From the manually cleaned unit types to the automatic self-cleaning models capable of retaining 40 lbs. of dust per filter cell in width, they offer unsurpassed performance and suitability to the particular job in hand.

MIDWEST AIR FILTERS

INCORPORATED Offices in Principal Cities

BRADFORD, PA.

Figure on finned Tubes

They have these advantages:

More surface
Fewer tubes
Fewer joints
Greater capacities

RADIAFIN TUBES

for air-heating or air-cooling units

have 6 to 10 times as much surface as plain tubes of same size

½" to 6"—Lengths up to 15 feet
High or low pressure — Plain or flanged ends
Quantity production—With or without headers

SCHUTTE & KOERTING CO., 1153 Thompson Street, PHILADELPHIA, PA.

TURTLEBACK
TRADE MARK

REGULATES FRESH AIR

The Turtleback Air Diffuser is an improved floor ventilator so constructed as to provide close regulation of air, with a free flow at all adjustments.

"Turtlebacks" are highly advantageous for the fan system used in theatres, schools and auditoriums, where close regulation and free air flow are demanded.

Easily installed, simply adjusted, and rigid when locked in place by center set screw.

Write for illustrated catalog

VENTILATING PRODUCTS CO.
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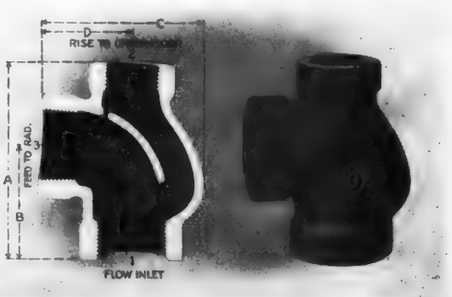
Blake Testite O. S. Distributor Fittings

SAVE FITTINGS, LABOR, FUEL—
INCREASE CIRCULATION



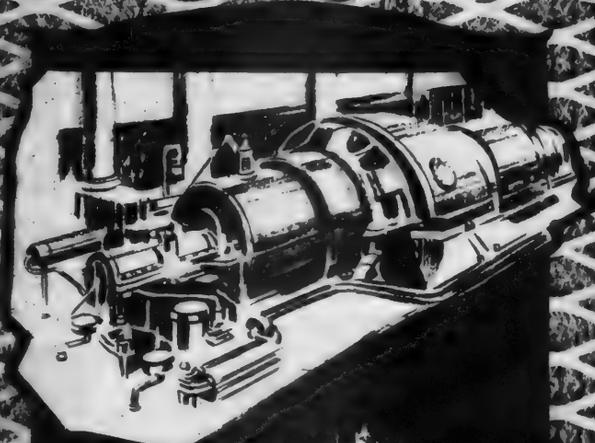
For Hot Water Heating Systems and Domestic Hot Water Supply

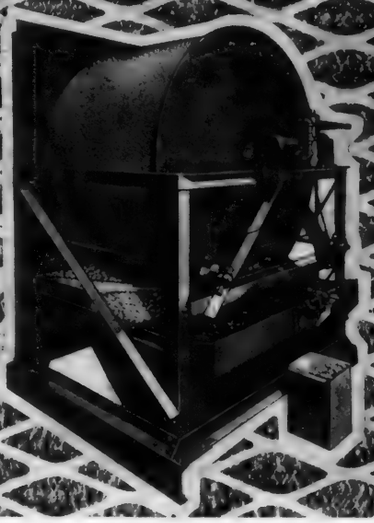
Perfect Control of the Circulation. No Short Circuiting. The Lip Distributes the Water Evenly

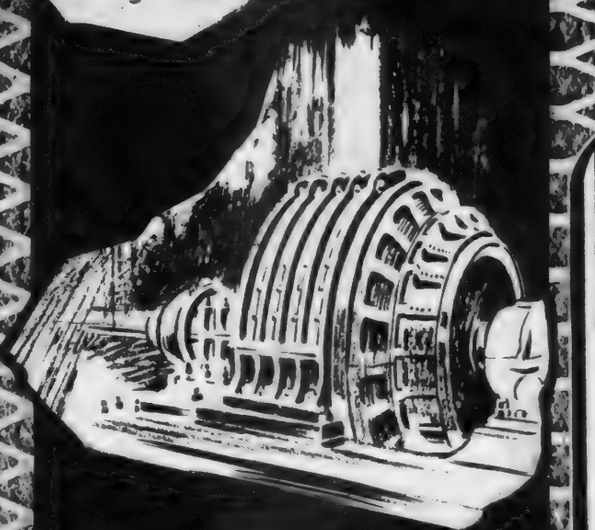
Made in 39 Sizes
Your Jobber Will Furnish Them

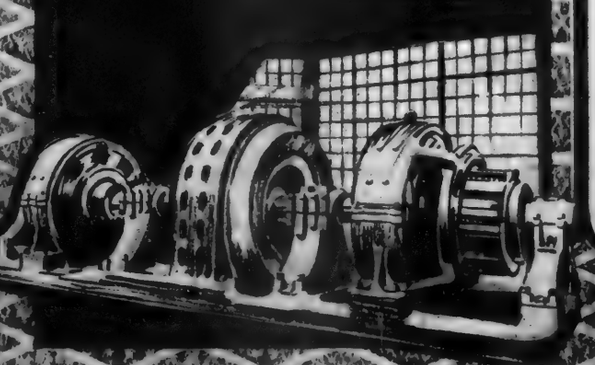
BLAKE SPECIALTY COMPANY
ROCK ISLAND, ILLINOIS

It Cleans the Air ~Then Cleans Itself









A Power in the Power Field

Mill Motors • Turbo-Generators • Rotary Convertors

A great part of the credit for the supremacy of the NATIONAL ROTARY in the ventilation of Electrical Equipment is due and, hereby, cheerfully acknowledged to leading Electrical Engineers throughout the country. Their cooperation and constructive criticism have made this achievement possible.

NATIONAL ROTARY has come along no royal road in its march to decisive leadership in the Power Field. These same Engineers have, also, demanded that we show them something better than they had previously known—they took nothing for granted.

Air Filtration, as applied to electrical equipment, has now taken its place as a real engineering problem. Therefore, an air filter should not be considered a "piece of merchandise," but should be selected the "engineering way."

Visit Our Exhibit Chicago Power Show Booth 443

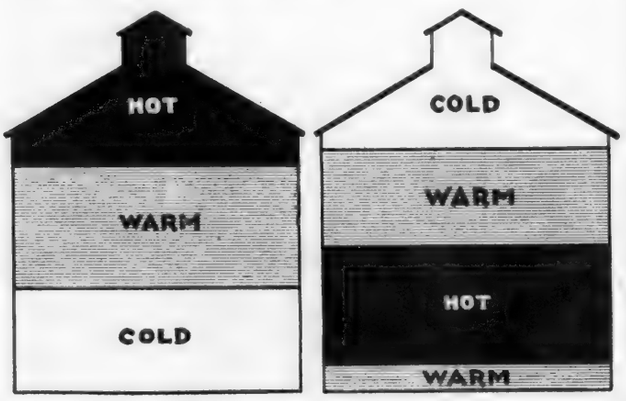
NATIONAL AIR FILTER COMPANY

NATIONAL

5130 Ravenswood Ave. CHICAGO

Heat Your Plant the New Way!

Heating methods for factories and mills have been revolutionized in the past few years, as shown here:



THE OLD WAY THE NEW WAY

Note the glaring waste and inefficiency of old style obsolete heating systems when compared with science's latest method as exemplified by Pecco Unit Heaters.

Pecco Heaters force the heated air horizontally across your factory floor at just the proper height to keep the inmates warm—instead of permitting it to waste its warmth far above the workers' heads.

Install Pecco Unit Heaters and watch your fuel bills shrink! Can be installed in your present building without material change in your heating plant. Write for a descriptive booklet which tells the complete story.

PECCO, *Incorporated*

2980 North Market Street, St. Louis, Mo.

Please send me a copy of booklet "Pecco Unit Heaters."

Name .....

Address .....

.....

The Herman Nelson hiJet Unit Heater

With

The Wedge Core RADIATOR

Leak-proof, rust-proof, indestructible. Lower installation cost, smaller pipe lines, no reducing valves necessary. Never requires service. Freezing cannot harm it. Operating steam pressure from 1 to 150 lbs. Can be suspended from pipe lines or moved from place to place. Long range heat distribution. The ideal heating unit for

Factories · Mills · Railroad Shops · Roundhouses
Warehouses · Garages · Gymnasiums · Auditoriums

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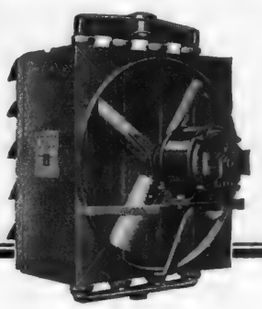
THE HERMAN NELSON CORPORATION
MOLINE ILLINOIS
Makers of the
UNIVENT *and the* HERMAN NELSON INVISIBLE RADIATOR

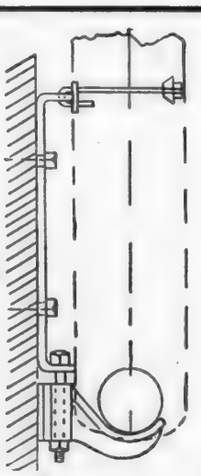


Write for your copy of the Herman Nelson hiJet Unit Heater catalogue

THE GLEOCKLE

Wrought Iron Adjustable

RADIATOR BRACKET



Patented
No. 9 Bracket for Legless Column Radiation

Bound to Meet Requirements

In specifying Gleockle Wall Radiator Brackets you can be sure they will meet all requirements. They are carefully designed and constructed to fit any make of wall radiator, are adjustable, sanitary, indestructible, and easy to erect. They are specified where the best of equipment is required.

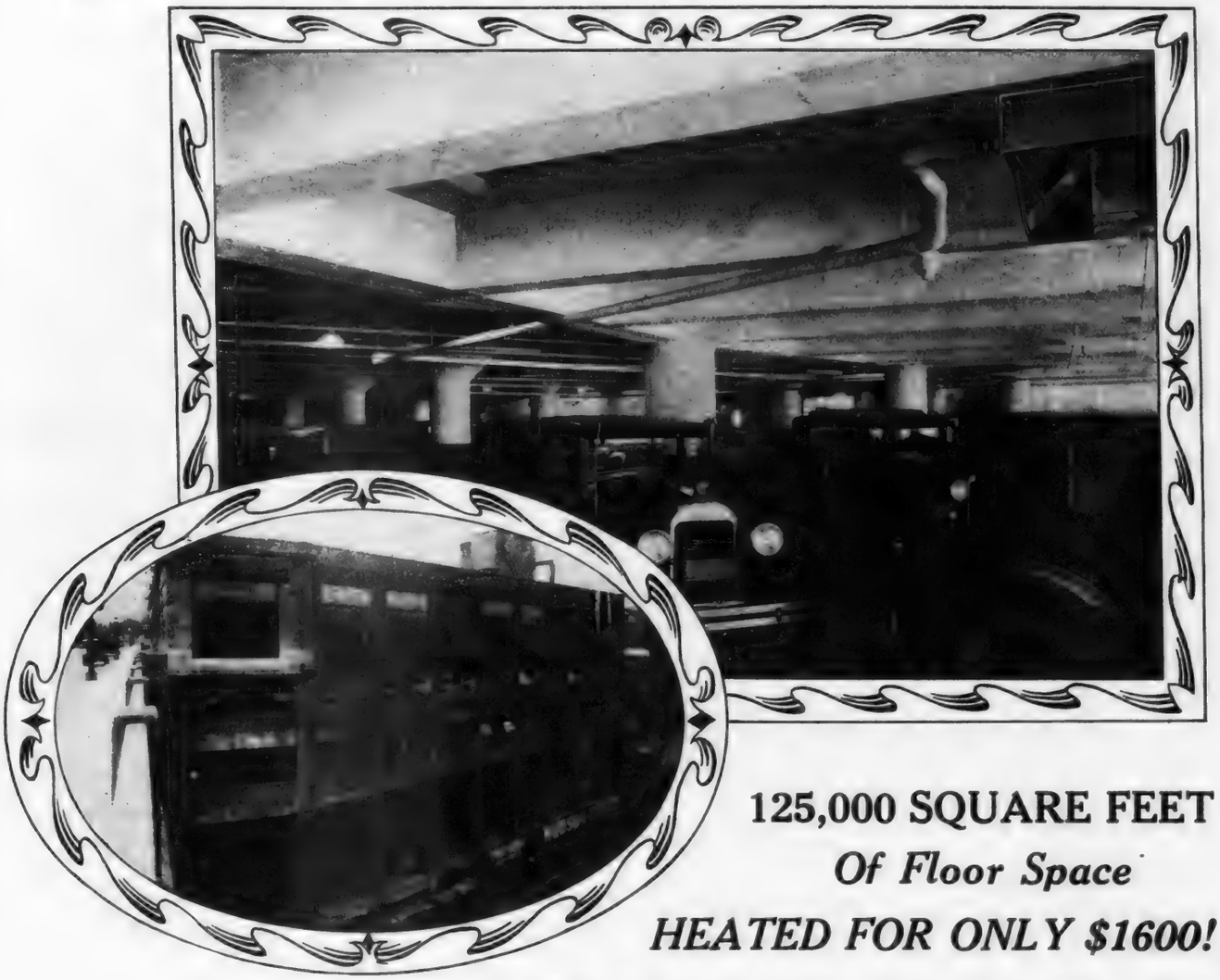
FIT ANY MAKE OF WALL RADIATOR

Send for descriptive booklet and trade discount

A. F. GLEOCKLE, Jr.

415 Bay Street **Rochester, N. Y.**

WING FEATHERWEIGHT UNIT HEATERS



125,000 SQUARE FEET
Of Floor Space
HEATED FOR ONLY $1600!

Pierpoint Motor Company Building, Pittsburgh, having a total floor area of 125,000 sq. ft., is heated throughout by 23 Wing Featherweight Unit Heaters. The total fuel cost last year was only $1600!

The building has a total volume of 2,000,000 cubic feet. 397 tons of Pittsburgh run-of-mine coal were burned during 218 days of heating operation—a remarkably low fuel consumption! Even on the coldest days the building was perfectly heated.

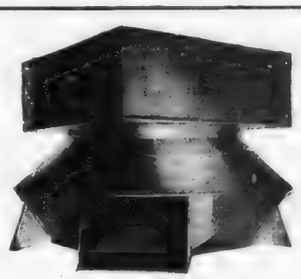
Located overhead, Wing Featherweight Unit Heaters save floor space and are out of the way of cars and mechanics. Wing Heaters take the air at the ceiling where it is already warm, reheat it, and then deliver this warm air to the working floor, just where it is wanted. More comfortable working conditions are maintained, and heat is saved besides.

Get full information today by writing for the Wing Heater Bulletin.

L. J. Wing Mfg. Co.

Hudson and 13th Sts., New York City

Heat with Unit Heaters



Low Ceiling Type

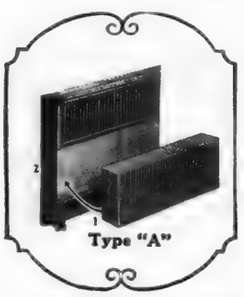
High Ceiling Type

Living Room in the W. E. Hyde Residence, Memphis, Tennessee

No space wasting radiators here . . .

for in the modern home, exposed radiation is obsolete. Nothing must interfere with refinement of interior arrangement and decorations.

Built right into any standard 4" wall or partition—the Herman Nelson Invisible Radiator occupies no floor or wall space. It is not camouflaged—but *concealed*. Only the attractive outlet grille is visible.



Radiator (1) comes installed in a steel case (2) more substantial than the wall itself. The complete unit is ready to install in any Standard wall or partition.

Once installed, the Herman Nelson Radiator is out of sight and out of mind. Indestructible leak-proof and trouble-proof—it is the last word in modern heating.

Architect, heating engineer, contractor, and everyone interested in new home or modern building construction, should know the facts about the Herman Nelson Invisible Radiator.

THE HERMAN NELSON CORPORATION,
MOLINE, ILL.
Builders of Successful Heating and Ventilating Equipment for 20 Years

FREE
This interesting book of facts on The Herman Nelson Invisible Radiator.

THE HERMAN NELSON CORPORATION
Moline, Illinois

Please send me your illustrated book No. 39. I am planning to build a house containing ..... rooms.

Name .....

Address .....

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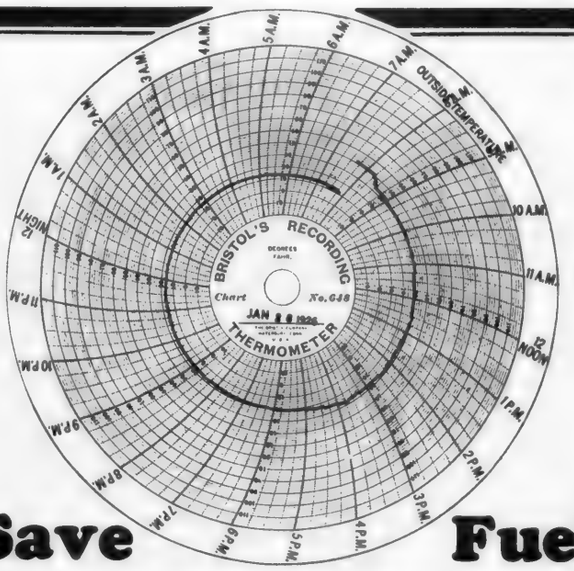
HERMAN NELSON *Invisible* RADIATOR

TRADE MARK

With the Wedge Core

INDESTRUCTIBLE



Save Fuel

By Keeping a Check on Out-Door Temperatures

Greater economy in boiler room operation is possible when the engineer can direct firing operations under the guidance of continuous chart records of out-door temperature.

Note how clearly the record line on the above chart shows the gradual drop in temperature. Starting at about 40° at 7.40 o'clock in the morning a drop of 30° is recorded up to the same time the next morning. As a result of having such a chart for reference, demands on the heating system can be anticipated and more uniform firing assured.

Bristol's Recording Thermometers are of sturdy construction; simple and direct in operation, and will give years of dependable service without trouble. Write for complete information.

The Bristol Company
Waterbury • • Connecticut

Frost Research Laboratory

A nationally recognized Research Service for the Heating and Ventilating Industry.

Our new Laboratory (now under construction) will be ready for boiler testing about February 15th.

Contracts placed now for tests for boiler rating assure the complete performance data being in your hands in time for the opening up of spring business.

The radiator test room will be ready for service about April 1st.

Frost Research Laboratory, Inc.
48 Curren Arcade, Norristown, Pa.

Now — a new standard of quietness in unit ventilator operation!

QUIET—where is it more essential than in the schoolroom, the office, the church and other places where unit ventilators are commonly used? And it is to these places that this New Model Sturtevant brings a new standard of quietness in unit ventilation.

Only to observe this unit ventilator when running is to really appreciate how smooth and quiet in operation it is.

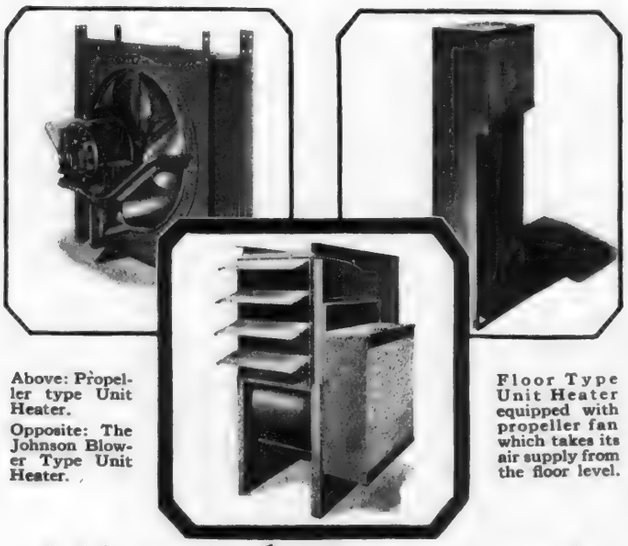
The fan wheels of the New Model Sturtevant are fifty per cent larger in diameter than those used in other makes for the same rating. For this reason they can be run very slowly; the air moves with a low velocity and noiselessly. An added advantage gained through the use of these slow speed fans is a saving in electric power.

If you are planning an installation of unit ventilator equipment, do not fail to get complete information on *The Silent* Sturtevant. The nearest office below is at your service and will gladly send you a copy of our Bulletin No. 344-A.

B. F. STURTEVANT COMPANY, HYDE PARK, BOSTON, MASS.

Atlanta	Charlotte	Dallas	Indianapolis	Montreal	Rochester
Boston	Chicago	Denver	Kansas City	New York	St. Louis
Buffalo	Cincinnati	Detroit	Los Angeles	Pittsburgh	San Francisco
Camden	Cleveland	Hartford	Minneapolis	Portland	Seattle
		Washington	Toronto		

Sturtevant REG. U.S. PAT. OFF. *the Silent Unit Ventilator*



Above: Propeller type Unit Heater.

Opposite: The Johnson Blower Type Unit Heater.

Floor Type Unit Heater equipped with propeller fan which takes its air supply from the floor level.

All unit heater needs
are met by this broad line

THE Johnson line of unit heaters is a line on which the contractor can safely *standardize*. Every Johnson installation can be made an ideal installation because there is a Johnson Unit Heater for each specific requirement. Of few other lines can this be so definitely said.

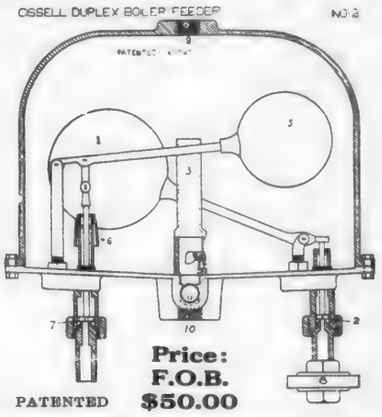
In considering unit heaters, remember that the first high velocity ceiling type heater ever built was a Johnson, and that much of the present popularity of this type is a direct result of the pioneering steps carried out in the Johnson plant. Whatever type of Unit heater is required—blower type or propeller type; for either floor or suspended installation—you will find it in its highest development in the Johnson line. All have the light copper type radiator which permits a higher rate of condensation than any other. All possess the uncompromised quality on which the Johnson reputation is founded.

Let us show you why it pays to concentrate on the Johnson line

JOHNSON FAN & BLOWER COMPANY
1325 W. Lake St., Chicago

JOHNSON
-the pioneer high velocity
Unit Heater

Now is the Time
For Real Boiler Protection
While Also Increasing Its Efficiency



Price: F.O.B.
PATENTED **$50.00**

This Duplex feeder, built especially to meet conditions existing in heating boilers, will make your boiler absolutely automatic, eliminating danger of burning boiler or cracking sections. In selecting a boiler feeder you want the best; thousands of these feeders are in use and never a complaint. So sure are we as to its efficiency, that we sell it with an ABSOLUTE GUARANTEE.

Write for Full Particulars and Discount

Manufactured by

W. M. CISSELL MFG. CO., INC.
111 South Second Street LOUISVILLE, KY.

36 Years of Experience

Emerson motors in stock and special designs are serving a wide variety of motorized devices including:—

1/30 to 2 h.p. A.C. and D.C. for all commercial circuits.

Pumps
Blowers
Humidifiers
Air Washers
Unit Heaters
Exhaust Fans
Ventilating Fans
Ozone Machines, etc.

Call on our 36 years' of experience and our field and laboratory staff of trained engineers to solve your motor problem quickly in these or kindred fields.

THE EMERSON ELECTRIC MFG. CO.
2018 Washington Ave., St. Louis, Mo.
806 W. Washington Blvd. Chicago, Ill.
50 Church St. New York City

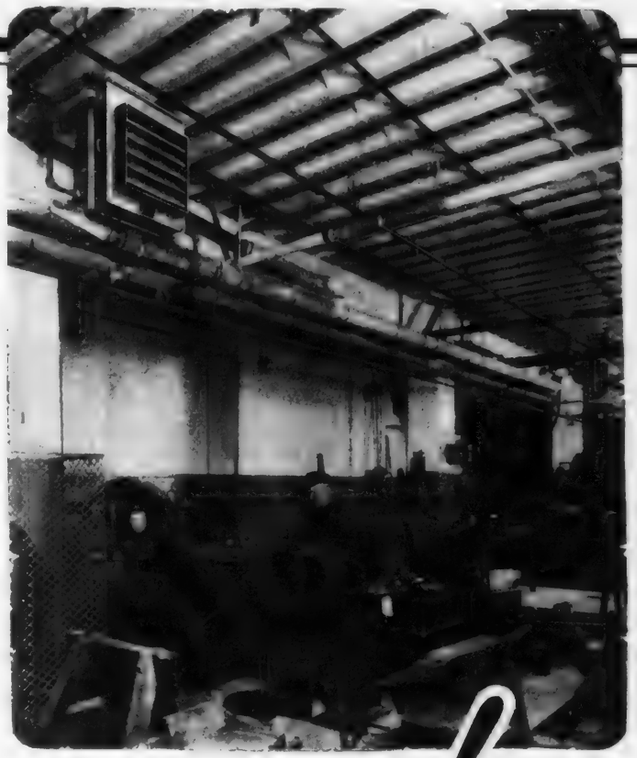
BUILT TO LAST
EMERSON
MOTORS *and* FANS

SPLIT-PHASE POLYPHASE DIRECT CURRENT

RE-PULSION START INDUCTION

Send for this booklet—

It explains why Peerless Unit Heaters are rapidly displacing ordinary steam radiators in factories, garages, and other industrial buildings.



Less Expensive!

The picture shows two Peerless Unit Heaters in the New York Service Shop of the Otis Elevator Company. These Peerless Heaters, and others upstairs in the same building, are well liked by the skilled mechanics who work in this shop.

Note these outstanding advantages of Peerless Unit Heaters: *Lower first cost*, as compared with ordinary steam radiators; less piping, fewer valves and fittings, less time and labor to install. Quicker heating—working zone heated first, not the space near the roof. Perfect control of temperature; heat can be shut off quickly by stopping the motors; less opening of windows. Complete circulation of air throughout the room, without drafts. Mechanical ventilation easily provided for, if desirable. Uniform heating, even in hard-to-heat corners. Enormous savings of weight and floor space.

Also large savings of steam in moderate weather and when rooms are unoccupied. Automatic control, if desired. Easily applied in old buildings as well as new. Simple construction, dependable operation. Suspended or floor-type units, as required, and competent engineering service.

Write for the Peerless Unit Heater Booklet *now* while you have it in mind.

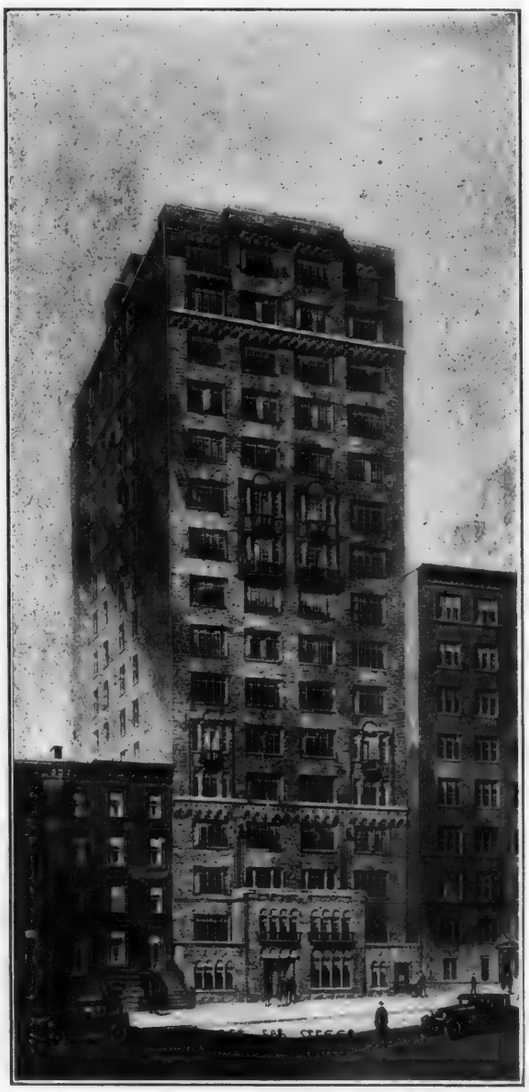
PEERLESS UNIT VENTILATION CO., INC.

718-34 Crescent Ave., Bridgeport, Conn.

Offices in Principal Cities

PEERLESS UNIT HEATER

Equipped with De Bothezat Disc Pressure Fans



STUDIO APARTMENTS
138 West 58th Street, New York City
Sugarman & Berger, Architects

"Our fans will not do the work, you will have to install blowers"

was the statement of a prominent fan manufacturer. But the DeBothezat Company was called in and have conclusively proven that DeBothezat Disc Pressure Fans could take care of the job economically and with low installation costs. At the same time the initial low cost of DeBothezat Pressure Fans is an advantage every engineer and contractor will appreciate.

Three saving factors prevailing when installing DeBothezat Pressure Fans:

1. Initial cost. 2. Installation cost.
3. Operating cost.

Write for Catalogue H.V.

DE BOTHEZAT IMPELLER CO., Inc.
1922 Park Ave., New York City

Sterlco
TRADE MARK

"KWIC-LIFT"

MOST PRACTICAL

CEILING RADIATOR

HANGER MADE

"The Up-Up-Up Hanger of the Century"

No Scaffolding

No Jacks

No Broken Backs

Inserted Between Columns of Radiator

Ask Your Jobber For Them

STERLING ENGINEERING CO.
1640 Holton Street MILWAUKEE, WIS.

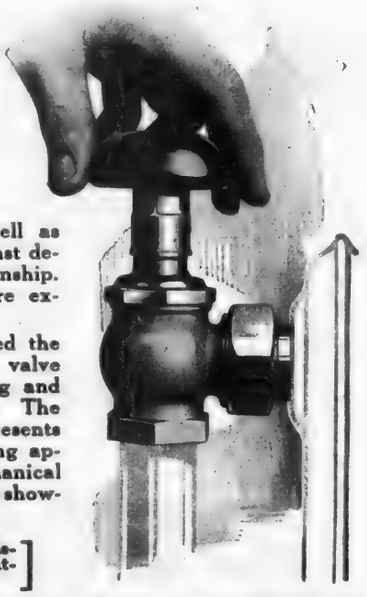
CAPITOL

High Quality of Capitol Valves Reflected in 1927 Sales Record

As another evidence of the in-built quality of Capitol products, 1927 has shown a bigger volume of radiator valve sales than any other previous year.

The experience and conscientious effort of 29 years is back of every Capitol valve as well as the Capitol guarantee against defective material or workmanship. Capitol valves are no more expensive than others.

At the right is illustrated the Sta-Pak Steam Valve—a valve that never needs repacking and will not leak around stem. The Capitol Sta-Pak line presents valves of extremely pleasing appearance and unusual mechanical features. Write for catalog showing complete line.

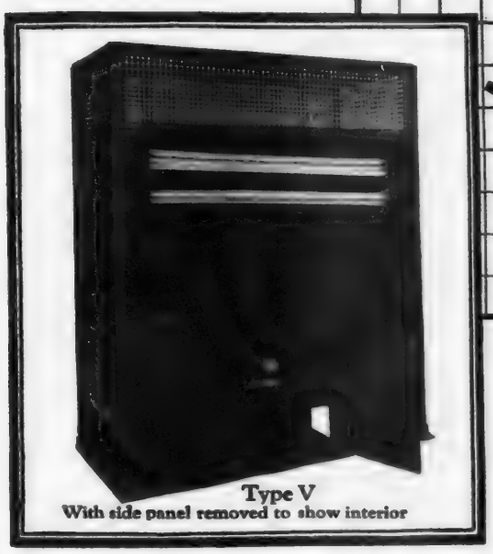


[Michigan Smelting and Refining Company now operating Capitol Brass Works.]

CAPITOL BRASS WORKS

MANUFACTURERS OF BRASS VALVES, BOILER TRIMMINGS AND PLUMBERS' BRASS GOODS

DETROIT, MICH.



Type V
With side panel removed to show interior

The Peak of EFFICIENCY

is obtained with Massachusetts Unit Heaters

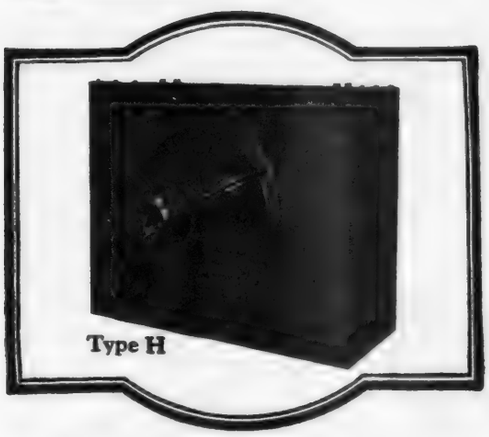
The Arcoblast heating element composed of staggered rows of metallicly attached fin-wound copper tubes expanded into two castiron tube sheets which, with the tapered design cast-iron header bodies flange-connected to the tube sheets, form the supply and return headers.

EACH Heater is self contained—consisting of Fan, Motor, Heater Coil completely encased. Heat supply for each section of the building can be controlled at will. The heating up period, in the morning, is reduced to a fraction of that required with a direct radiation system.

Massachusetts Unit Heaters are shipped assembled ready for operation. Type V Units are internally wired, Starting Boxes being mounted on the Unit. When in position, only steam and external electrical connections are necessary.

The Type V Unit, drawing cool air from a point just above the floor level, and discharging horizontally at high velocity just above the breathing or working zone, distributes the heated air in the breathing zone. The air inlet of Type V Unit Heaters, being just above the floor line, removes the lower strata of cool air, allowing the warmer strata in the breathing zone to fall, thus insuring a uniform temperature.

The design of the Unit Heater, is such as to enhance the appearance of its surroundings, replacing unsightly units with an efficient, mechanically correct means of heating. Ornamental grilles of pleasing appearance replace the usual cowls, elbows and baffles.



Type H

Where floor space is not available we recommend the Ceiling Type H Unit Heater, built in three sizes, 18", 24" and 30" deflector plates and re-circulating boxes can be furnished if required.

MASSACHUSETTS BLOWER DIVISION *of*
THE BISHOP & BABCOCK SALES CO.
General Offices: 4901-4915 Hamilton Ave., N. E.
Cleveland, Ohio

BISHOP & BABCOCK

TEMPERATURE REGULATION
HEATING SPECIALTIES VENTILATING EQUIPMENT

SUPER HI-LO PROPELLER FANS
CLASS A CLASS A CLASS A CLASS A
TRADE MARK REG.

Write for it Today!

The Amazing Story of this Marvelous FAN is Now Ready!

"A New Era in Ventilation"

"A New Era in Ventilation" is the title of an illustrated descriptive folder which is just off the press.

It tells the complete story of the *Super Hi-Lo Propeller Fan* . . . the history of its discovery . . . the theory of its better basic principle . . . its Bird-Wing Construction . . . the truly marvelous results it achieves . . . proof of its greater economy in initial cost and upkeep!

The *Super Hi-Lo Propeller Fan* opens a new era in the heating and ventilating field. It meets the *three big needs* of fan construction — LARGER AIR CAPACITY, LESS POWER CONSUMPTION, SILENT OPERATION. You cannot afford to miss this free folder. Write for it today . . . on your business letterhead, please.

Distributors, Manufacturers' Agents and Dealers!—Write for details of exclusive selling franchise.

SINCLAIR EQUIPMENT CORP.

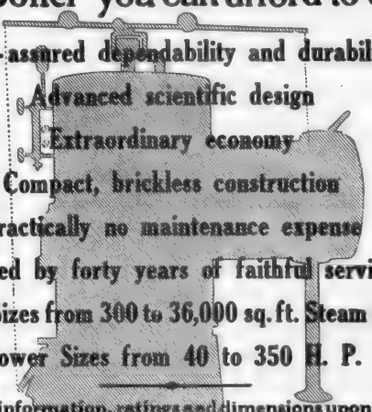
Manufacturers of Super Hi-Lo Propeller Fans Heating and Ventilating Systems

General Offices and Plant

500 S. Peoria Street Chicago, Ill., U.S.A.

MOST ECONOMICAL IN FUEL
1866
THE FITZGIBBONS BOILER

FITZGIBBONS STEEL BOILERS
"The Boiler you can afford to own"



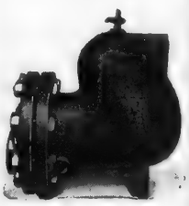
Steel-assured dependability and durability
Advanced scientific design
Extraordinary economy
Compact, brickless construction
Practically no maintenance expense
Proved by forty years of faithful service
Heating Sizes from 300 to 36,000 sq. ft. Steam Rating
Power Sizes from 40 to 350 H. P.

Complete information, ratings and dimensions upon request

FITZGIBBONS BOILER CO.
INCORPORATED
570 Seventh Ave., New York, N. Y.

THE VALVE

Simple in construction, yet highly efficient in operation.



THE STEAM TRAP

Made in capacities up to 75,000 lbs. per hour.

A Sturdy Trouble-proof Steam Trap

No complicated parts to get out of order in the Paracoil Steam Trap! This trouble-proof trap is so sure in its operation that it is *guaranteed against repairs* for two years.

The only moving part, the recessed aluminum bronze valve ball does not lift, but rotates over the port, thus assuring long life and a constant flow of condensate.

Paracoil Steam Traps are used and endorsed by many of the largest and most discriminating concerns. Write for catalog and specifications.

DAVIS ENGINEERING CORP.
90 West St., New York City
Factory: Elizabeth, N. J.

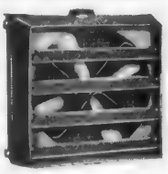
Paracoil Steam Trap

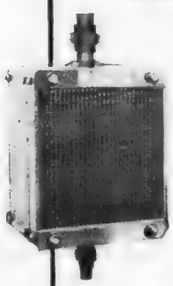
5 years of remarkable success on the nation's "toughest" heating jobs

The first complete line of Unit Heaters ever built

Utility Heater No. 101

The newest Thermodine. Weighs only 40 pounds. Replaces approximately 100 sq. ft. of cast iron radiation. Silent in operation.



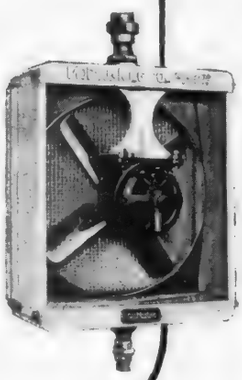


No. 301

Weighs only 75 lbs., replaces 250 to 275 sq. ft. c. i. radiation. Widely used in large offices, lobbies, etc.

No. 701

Weighs only 125 lbs., replaces 700 to 800 sq. ft. c. i. radiation weighing approximately 4,900 lbs. Suspends from steam line. Like all Thermodine Heaters may be installed to supply heat any direction.



WHEN introduced five years ago, the Thermodine Unit Heater was a radical departure from anything the heating world had seen.

Many of the early Thermodine installations were replacements — jobs on which ordinary equipment had been unable to produce heating satisfaction. And, Thermodine Unit Heaters made good right from the start. Today there are thousands in use—in practically every field of industrial heating and drying.

That is the remarkable history of Thermodine — the 125 pound Unit Heater that replaces over 4900 pounds of direct radiation — that suspends from the steam line up out of the way, conserving valuable floor space — that supplies heat any direction, down to working levels where heat is required — that is most economical to install — that provides better heating at less cost.

There's a Thermodine Unit Heater for any size space — small offices, large factories. The motor driven fan that diffuses heated air in winter may be used to circulate and cool the air in summer. All-year utility. Whatever your heating or drying problem may be, find out about the Thermodine — backed by five years of outstanding success.

Write today for Catalog 127. This book gives you full details about the complete line of Thermodine Unit Heaters for industrial heating and drying.

MODINE MANUFACTURING CO.

1707 Racine Street Racine, Wisconsin

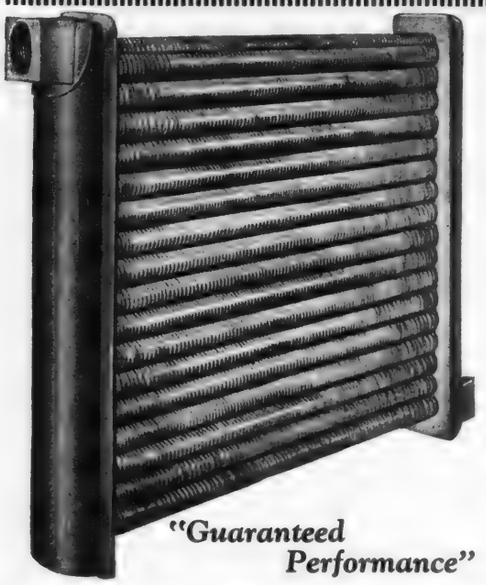
Branch Offices in All Large Cities

ThermModine

THERMODINE

UNIT HEATER

FOR STEAM OR HOT WATER HEATING SYSTEMS



"Guaranteed Performance"

Engineering data covering the performance of Rome HELICALFIN Heaters has been prepared by a nationally known test engineer and is available upon request.

HELICALFIN

Extended Surface Radiation

Meets the Demands of Modern Heating and Ventilating Progress

For Permanency and High Efficiency
Specify

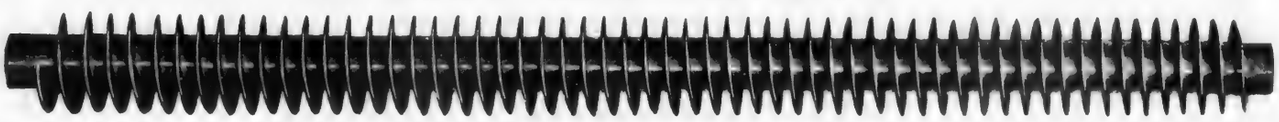
Rome Helicalfin Heaters

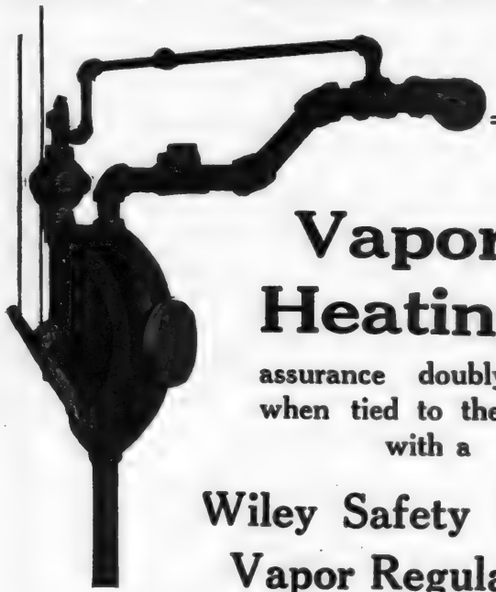
Helicalfin Heater Units and Radiators offer great advantages in high efficiency. The cores consist of tubes and headers made of copper and brass. They are sturdy, compact, light in weight, and last indefinitely with practically no corrosion.

Helicalfin Heater Units and Radiators are the ideal heating equipment for Homes, Schools, Institutions and Industrial Plants.

Rome Helicalfin Radiation has from five to nine times radiating surface of plain tube with proportionate increase in efficiency.

ROME-TURNEY RADIATOR COMPANY, Rome, N. Y.
Makers of Good Radiators since 1905





Vapor Heating

assurance doubly sure when tied to the boiler with a

Wiley Safety Vent Vapor Regulator

Write for your copy of booklet describing the Wiley line of vapor heating specialties.

peerless quality product manufactured and sold exclusively by

The Simplex Heating Specialty Co.
(INC.)
Lynchburg, - Va.

THERMOSTATIC METAL

The most accurate, constant and durable of expansion units

FOR LOW AND HIGH TEMPERATURES

Our No. 1800 metal for temperatures below 450° F.
Our No. 2600 metal for temperatures below 1500° F.
Other High Heat Metals for special uses.

Positive and Dependable Thermostatic Metals

W. M. CHACE VALVE COMPANY
1600 Beard Avenue
Detroit, Michigan

CONTROL THE SPEED
OF YOUR VENTILATING EQUIPMENT!
REGULATE WARM AND COLD AIR VOLUME
WITH THE TIME TESTED
HORTON
VARIABLE SPEED
PULLEY

HORTON MANUFACTURING COMPANY
3008-3016 University Avenue S.E. Minneapolis, Minn.
MINNEAPOLIS REFERENCES
Morgan-Gerrish Co. Richardson-Boynton Co. Foreman Cook Co.
American Foundry & Furnace Co. St. Paul

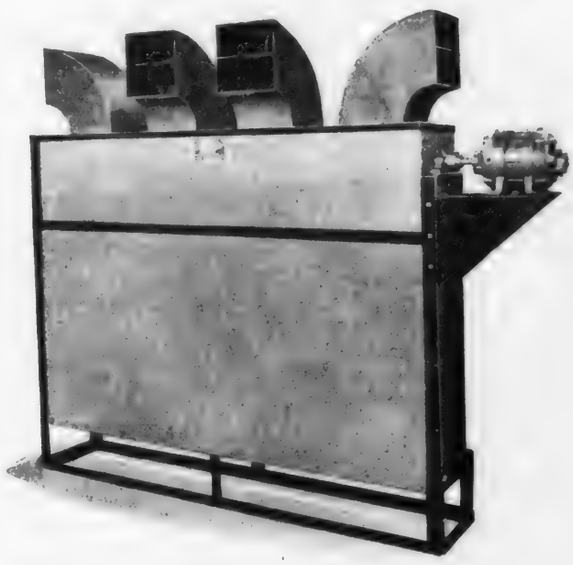
a significant movement

THE scientific combination of principles found only in York Heat-Diffusing Units has brought about increased sales and widespread interest far beyond all reasonable expectation.

In February we are making an announcement which will still further throw the spotlight on York activities and York progressiveness.

Contact with the local York representative during 1928 should be productive of much helpful information. York Heating & Ventilating Corporation, 1506 Locust Street, Phila., Pa. Representatives in principal cities.

YORK
HEAT-DIFFUSING
UNIT



THE SMOKE BOMB DEMONSTRATION
Note how the warm air, made visible by smoke, is held in the working zone. A single unit of proper capacity can warm a shop 200 feet long by 60 feet wide.

YORK
Heat-Diffusing Unit

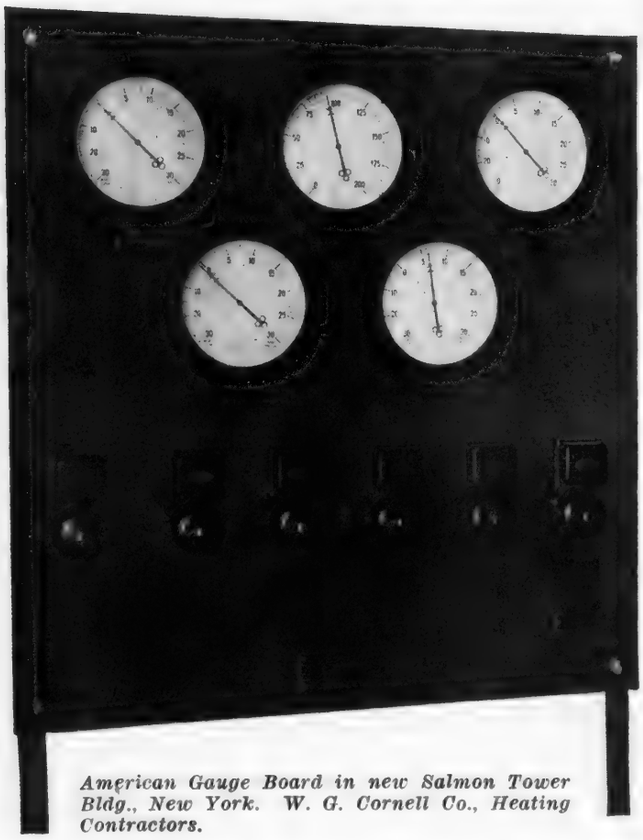
YORK HEATING & VENTILATING CORPORATION, PHILADELPHIA

Engineered Products

Manufacturers of the Famous York Air-Conditioning Units

HEAT WITH UNIT HEATERS

GAUGE BOARDS



American Gauge Board in new Salmon Tower Bldg., New York. W. G. Cornell Co., Heating Contractors.

American Gauges, Recording Gauges, Dial Thermometers, Recording Thermometers and Clocks are furnished in the same style of case for uniformity of appearance, either for wall or flush mounting. They make beautiful gauge board installations.

Write for the following Catalogs:

Gauge Catalog A-14,
Recording Gauge Catalog E-14,
Gauge Tester Catalog D-14,
Relief and Pop Valve Catalog V-14,
Thermometer Catalog F-14,
Dial Thermometer Catalog G-14,
Recording Thermometer Catalog H-14,
Temperature Controller Catalog R-14.

AMERICAN INSTRUMENTS

AMERICAN SCHAEFFER & BUDENBERG CORP.
338 Berry St., Brooklyn, N. Y.
Branches in Principal Cities
Makers of American Industrial Instruments since 1851.

Breaking the Record for Low Coal Bills and Efficiency!

Low pressure steam and hot water heating boilers and tank heaters that burn No. 1 Buckwheat . . . . . No mixing with expensive coal . . . . . Magazine needs filling only once in 12 to 24 hours . . . . . No blower. No motor. No electric current. No machinery to get out of order . . . . . Twenty-one sizes . . . . . *Coal bills cut one half!*

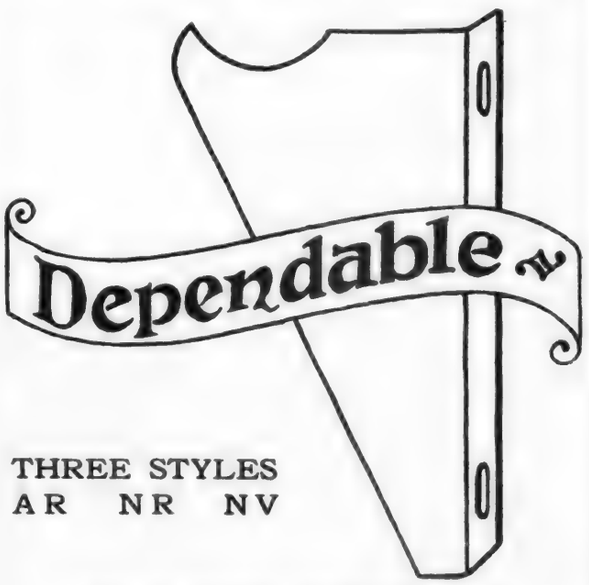
Have you our Catalog and Price Sheets?

The MOLBY HEATING BOILER

and Heavy Duty Tank Heater

MOLBY BOILER COMPANY
(Subsidiary of The Universal Pipe and Radiator Company)
New York: Graybar Building, 420 Lexington Ave.
Landsdale, Pa.: 41 Central Ave.

HARTMANN RADIATOR BRACKETS



THREE STYLES
AR NR NV

Write for Descriptive Circular and Price List

CHARLES HARTMANN CO.
997-593 Dean Street BROOKLYN, N. Y.

Outdoor Air Indoors

Lakeside

Quiet *Electric* VENTILATOR

Announcing the NEW "TYPE L-1"

Equipped with Four-way Air Deflector

Designed especially to meet the requirements of ventilating engineers for an electric ventilator that is highly efficient and quiet in operation which deflects fresh, outside air in any direction, desired, and is remarkably low in operating cost.

Thirty-two individual blades furnish the maximum volume of air and nine adjustable deflector blades [4 horizontal and 5 vertical] control the direction of the air current. Equipped with self-aligning SKF Bearings throughout, especially designed impeller, and silent Tex-rope Drive which insures quiet operation and permits compact installation. ¾ h. p. variable speed motor, capacity 10,000 cubic feet per minute.

WRITE FOR SPECIFICATIONS AND CATALOG of the complete line of Lakeside Quiet Electric Ventilators which meets practically every requirement for installations of this type.

Easy to Install

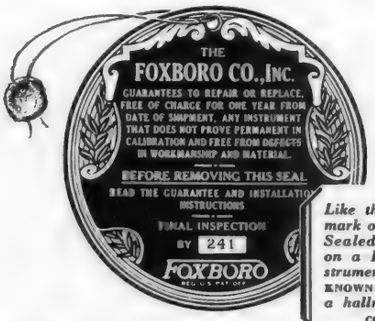
The Lakeside comes ready for installation. It requires no tearing down of walls or ripping up of floors. It is so compact that it fits into a very small space. It can be disassembled to move through small door openings, and installed satisfactorily in many places where it is impossible to install other types of ventilating system.

VENTILATING IXL SYSTEM

Low Priced
Low Cost of Operation

The Lakeside is very low priced, yet is remarkably efficient and is guaranteed to give satisfactory results. It is very inexpensive to operate and must "make good" in actual service because it is backed by a reliable guarantee. Lakeside Ventilators are easy to operate—and trouble free.

LAKESIDE COMPANY, 103 Main Street, Hermansville, Mich.


THE
FOXBORO CO., INC.
GUARANTEES TO REPAIR OR REPLACE, FREE OF CHARGE FOR ONE YEAR FROM DATE OF SHIPMENT, ANY INSTRUMENT THAT DOES NOT PROVE PERMANENT IN CALIBRATION AND FREE FROM DEFECTS IN WORKMANSHIP AND MATERIAL.
BEFORE REMOVING THIS SEAL
READ THE GUARANTEE AND INSTALLATION INSTRUCTIONS
FINAL INSPECTION
BY 241
FOXBORO
REG. U.S. PAT. OFF.

Like the Sterling mark on silver, the Sealed Guarantee on a Foxboro Instrument stands for KNOWN QUALITY.... *a hallmark of excellence*

The SEALED GUARANTEE

ON WHICH IS STAMPED YOUR PROTECTION AND OUR REPUTATION

THE FOXBORO CO., INC., announces a guarantee of materials, workmanship and permanency of calibration to be sealed to each Foxboro instrument.

Far-sighted manufacturers will appreciate at once the significance of this announcement. It means that, for the first time, a standard has been established for measuring the accuracy and reliability of an instrument which records or controls temperature, pressure, humidity or flow.

It means that, for the first time, the purchaser, before he purchases, is given tangible evidence that the instrument is capable of doing the work for which it is sold.

Only the finest instruments could be backed by such a guarantee ..... so specific in purpose, so broad in protection. Does your business deserve less?

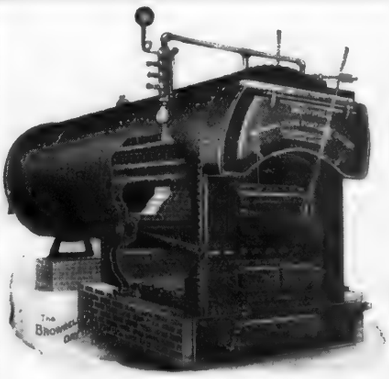
THE FOXBORO CO., INC.
Neponset Avenue, Foxboro, Mass., U.S.A.

NEW YORK · CHICAGO · BOSTON · PHILADELPHIA · DETROIT
PITTSBURGH · CLEVELAND · ROCHESTER, N. Y. · ATLANTA
PORTLAND, ORE. · TULSA · LOS ANGELES · SAN FRANCISCO

FOXBORO
REG. U. S. PAT. OFF.

THE COMPASS OF INDUSTRY

INSTRUMENTS FOR INDICATING, RECORDING AND CONTROLLING TEMPERATURE, PRESSURE, HUMIDITY AND FLOW



BEST In Boilers

If it is quality you are looking for in the boiler you buy, you will find it in the Brownell. If it is strength and safety—efficiency and economy—latest designs—adaptability to your particular heating requirements—you will find it in

BROWNELL BOILERS

On the market 72 years. Recognized as the "best in boilers." Riveted steel construction of accurately known strength. Positively not a welded boiler. Up to ASME and all state code demands.

Get into touch with nearest Brownell representative. Also write for illustrated bulletin B-6 A.

THE BROWNELL CO., Dayton, O.

Specify

Powell Valves

For Long Uninterrupted Service

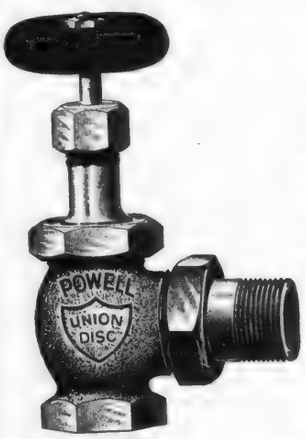


Fig. 163

POWELL COMPOSITE DISC VALVES

are furnished with bronze body and trimmings or in Iron Body with Bronze trimmings.

Bronze valves with union outlets are obtainable for both hot water and steam heating installations.

Discs are interchangeable with all standard vulcanized discs. However, we recommend Powell.

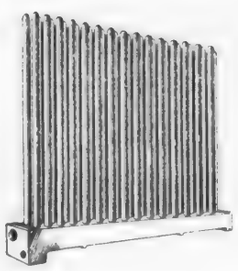
Descriptive circular on request.

THE WILLIAM POWELL COMPANY
Dependable Engineering Appliances
2521-2531 Spring Grove Ave., Cincinnati, Ohio

Plexiform Fans

The design of Bayley Plexiform Fans is based on modern requirements of a centrifugal discharge fan: maximum air delivery against low or medium high resistance, from a minimum of housing; highest obtainable mechanical efficiency, strength, lightness, *quietness in operation* and method of construction as equally adaptable to high as to low pressures and as practicable for double as for single width fans. It embodies to the fullest extent the well-known features of relatively small housings with large inlets and outlets, as standardized by leading manufacturers of air moving apparatus and accepted by engineers and architects generally.

The Bayley Turbo-Atomizer, heart of the Bayley Air Washer. Operates at nominal water pressure with a power saving of 40 to 60% as compared with the high pressure multiple spray system.

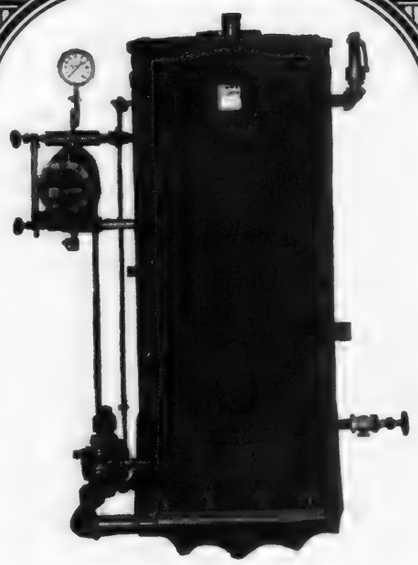


Bayley Chinook Heater — the most improved form of Indirect Heater. Construction is such that there are no return bends, elbows or nipples. Permits use of steam at either high or low pressure.

Write for Catalog No. 26, containing valuable reference data.

BAYLEY BLOWER COMPANY
742 Greenbush St., Milwaukee, Wis.

Bayley
AIR ENGINEERING & EQUIPMENT
HEATING AND VENTILATING
AIR WASHING AND HUMIDIFYING SYSTEMS
MILL EXHAUSTERS — PRESSURE BLOWERS
MECHANICAL DRAFT FANS
AIR AND GAS SCRUBBERS
INDUSTRIAL DRYING SYSTEMS



Increased Production Improved Quality and *How!*

A

KANE
(PATENTED)
FIRE TUBE

Automatic Gas Boiler

to generate your Steam is the answer.

It is controllable, reliable, efficient, clean, and its fuel cost stable —facts that Multiply Profits.

MEARS-KANE-OFELDT, INC.

Manufacturers of

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The American System of Temperature Indication

TYPE C

The Caliscope

is an electric device used for the remote indication of both wet and dry bulb temperatures, and without further use of charts or calculation, shows the comfort zones or the correct relation between the temperature and the moisture content of the air for the comfort of the occupants.

It centralizes your control and supplies the intelligence to properly operate the heating, ventilating and refrigerating systems.

ACCURATE and DEPENDABLE

OUR "NEW" SINGLE UNIT

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The Type A Caliscope is especially adapted for indicating temperatures where only a few elements are required in theatres, offices, public buildings, apartments, factories, cold storage plants and greenhouses.

This instrument is simple to install and guaranteed permanent in calibration.

Furnished complete with Thermoscope (dry bulb room element) including wire up to 300 feet.

Price $65.00

The American Temperature Indicating Co.

1017 Summit Street TOLEDO, OHIO

ARCTIC NU-AIR COMPLETELY CONTROLLED VENTILATION

Announcing
An Important New Development
in Ventilation

ARCTIC NU-AIR
VARI-SPEED
HYDRAULIC
CONTROL

ARCTIC NU-AIR presents its latest and greatest achievement in ventilating efficiency—the Hydraulically Controlled Vari-Speed Pulley. Many months of ceaseless experimentation and exhaustive testing behind closed doors have brought their reward.

Positive regulation of blower speed and air volume—is now a reality. Now Arctic Nu-Air Ventilation can be tuned to every degree of temperature. Summer cooling, winter air-conditioning and heat distribution, year 'round ventilating efficiency—every variation in air volume that comfort and climate dictate is assured by this device.

SIMPLE, SURE, SAFE

In operation, like in construction, the Hydraulic Vari-Speed Control is simplicity itself. A push or two of the plunger increases the pulley speed. A touch on the other plunger decreases it.

Because it is hydraulically operated, it is positive, smooth and quiet in its action. It never varies in pressure. Once set, the pulley maintains its exact relative speed until the pressure is changed. It responds instantly smoothly, evenly, to every degree of the pressure gauge.

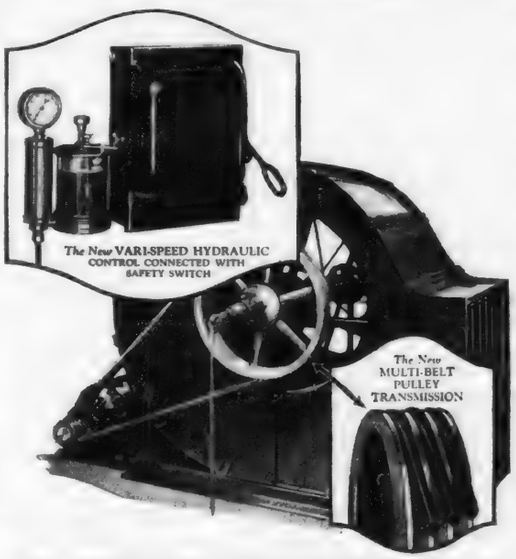
It is safe and trouble-proof. An automatic safety valve prevents operation of the blower beyond its maximum capacity. Damaging shocks, strains and stretching of belting due to peak load starting, are prevented by an automatic device which releases the pressure when the electric switch is thrown.

NEEDS NO ATTENTION

After Vari-Speed Hydraulic Control and Pulley are installed no adjustments are required. No complicated parts to get out of order—no costly replacements to make.

NEW MULTI-BELT

The Vari-Speed Pulley is equipped with either flat belt or the new Multi-Belt Transmission which insures quiet, smooth running and reduces slipping and stretching to a minimum.



OVER 3,000 INSTALLATIONS

Arctic Nu-Air Cooling, Ventilating, Humidifying and Heating Systems are proving their superiority in a score of different businesses and in homes and institutions. Included is the U. S. Government and some of the largest theatres, stores, hotels, clubs, restaurants, laundries, etc., in the country. Write us for some of these records of performance.

ARCTIC NU-AIR
CORPORATION

512-514 South 4th Street
MINNEAPOLIS, MINN.

Also Manufacturers of Sanidaire
Humidifying Systems
Cabinet Heaters — Unit Heaters —
and Blower Heating Elements

REMOTE CONTROL

The control unit can be placed at any distance from the blower desired. Thus complete control of the system is always at your finger tips.

IMPROVED TYPE OF BLOWER

The scientifically designed, sturdily constructed Arctic Nu-Air Blower is remarkably quiet, efficient and economical in operation. Such improvements as Air-Flex blades, by-pass silencer and shock-cushioned bearings are among the exclusive features which contribute to its dependable performance.

GUARANTEED RESULTS

Positive, constant variable speed regulation and greatly reduced current consumption are guaranteed with every Arctic Nu-Air Blower equipped with Vari-Speed Hydraulic Pulley and Hydraulic Remote Control.

Arctic Nu-Air has contributed several other improvements in the interest of more efficient and economical ventilation. Two of the oustanding exclusive features are:

The DUAL DEFLECTOR—an ingenious air distributing device which directs the air into every nook and cranny. Its patented design appears like a golden grille set within an art frame—harmonizing with any style of interior decoration or design.

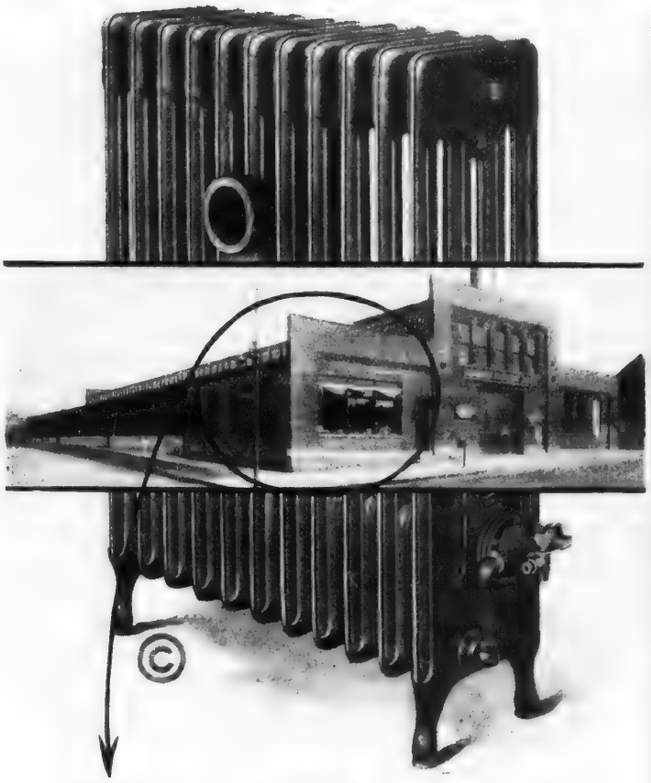
The AIR-O-SWITCH which permits changing system from blow-in to exhaust ventilator, or vice versa, by merely moving a lever, and without reversing motor or blower.

CREATING OPPORTUNITIES

Because of its adaptability to almost any ventilating, cooling, heating, humidifying and air-conditioning problem at a comparatively low cost, Arctic Nu-Air equipment is opening up thousands of profitable opportunities for the services of the architect, engineer and contractor.

We would like to explain this to you in more detail. Your request will bring complete information.

ARCTIC NU-AIR COMPLETELY CONTROLLED VENTILATION



How To Cut Your Client's Spring And Fall Heating Bills

At the Gregory Electric Co.—1601 S. Lincoln St., Chicago, Ill.—4 Clow Gasteam Radiators heat the 75 by 40 foot office. There is a central steam heating plant in the factory, but heat is not required there as early in the Fall nor as late in the Spring as it is in the office.

Gasteam heats this office after factory working hours—when drafting work, etc., is done. Gasteam gives them efficient heat any time of the day or night. It saves many dollars that would otherwise be spent starting the steam heating plant to meet these off-season and off-hour office heating demands. With Gasteam, not a bit of heat is wasted.

Send for our new catalog. See how every heating contractor can bring good profits in a new field even where plants are already equipped with a central plant.

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Change of Name

On December 12, 1927

the name of

GORTON & LIDGERWOOD CO.

was changed to

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Gorton Single Pipe Vapor Heating System
Gorton Quarter Turn Packing Lock Radiator Valves
Gorton Magazine Feed Tubular Heating Boilers

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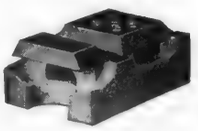
Start the New Year Right
By Installing Pyramid Grates and Reducing Coal Bills

Burns any size or kind of coal.



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Every shell makes its own hole. Used in ceilings, walls, floors and beams for fastening pipe hangers, etc., and for bolting timber and other equipment to concrete and stone. Internal U. S. Standard Threads for rods, bolts and screws.

Quickly installed by hand or with PHILLIPS SPRING HAMMER. No DRILLS required.

Write for full details

Phillips Drill Company
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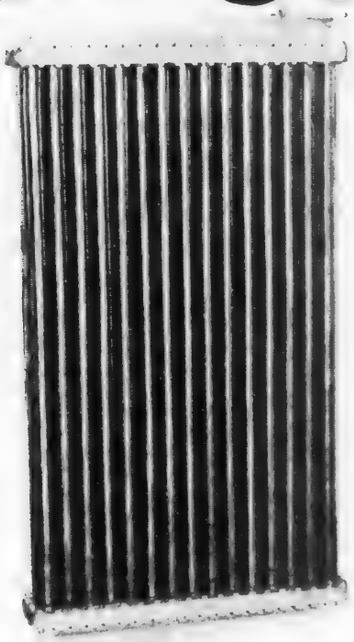
Briggs Body Plant Equips Mill Room

with

IDEAL ARCOBLAST HEATERS

For Unit Heater Work Only



Unit heaters furnished by Johnson Fan & Blower Co., Chicago, Ill. Pittlekow Heating & Engineering Co., Contractors; Albert Kahn, Architects.

22 ARCOBLAST Heaters are used to heat the Mill Room of the mammoth automobile body plant of the Briggs Manufacturing Co., Detroit. This mill room is 480 ft. long by 160 ft. wide.

As 180,000 cu. ft. of air per minute is exhausted by the sawdust conveyors and shaving exhausters, the mill room requires *the most effective type of heating apparatus.*

Air is drawn through window louvers by means of suction fans and is sent through ARCOBLAST or diverted through a by-pass depending upon the temperature of the room, the by-pass vent being thermostatically controlled.

These five outstanding features of Ideal ARCOBLAST Heaters will meet the engineer's most exacting demands in unit heater work:—

1. Rugged Unit Design.
2. No soldered Steam-backed Joints.
3. Non-corrosive.
4. Ample Tube Steam Carrying Capacity.
5. Minimum Weight without Impairing Strength.

Send for your copy of our Engineer's Data Book on the Ideal ARCOBLAST Heater. Gives roughing-in dimensions, physical data, friction data, final temperatures, condensation and pipe sizes.

AMERICAN RADIATOR COMPANY

VENTO DEPARTMENT: 816-820 South Michigan Ave., Chicago

Makers of IDEAL Boilers, AMERICAN Radiators, ARCO Tank Heaters, VENTO Ventilating Heaters, AIRID Air Valves, MERCOID Controls and devices for drying, humidifying, cooling and refrigeration.

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Grant Packless Twin Pump
with low pressure blower
Bulletin T P 2000 B

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OIL BURNER EQUIPMENT

Grant Packless Pressure Pump
with low pressure blower
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OIL BURNER EQUIPMENT
FOR OIL BURNER MANUFACTURERS
EVERYWHERE

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The Technical Staff of the Grant Accessories Corporation is composed of men of broad experience in design, sales and service in the oil burning field. Don't hesitate to bring your problems to us.

Motored Low Pressure Blower
Bulletin M B 900

Grant Oil Strainer
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107 LIBERTY STREET, NEW YORK

Automatic Shut Off Valve
Bulletin A.S.V. 500

As Simple as the Ordinary Kerosene Lamp

LACO OIL BURNER

Made in five adaptable sizes; guaranteed to heat the home or building to the maximum capacity of the heating plant. Economical. Proved by thousands of trouble-proof installations throughout the country. Write today for dealer terms and full particulars.

LACO GAS BURNER CO., Griswold, Iowa

The Down-Draft Does It!

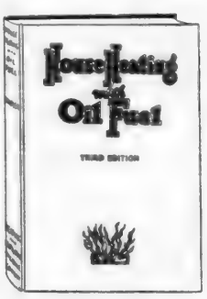
The downdraft principle is an exclusive, clinching argument for salesmen. Easily understood by home owners. Aladdin Oil Burners are leading in sales in many territories. Our franchise is desirable because it means profits. Write today.

ALADDIN UTILITIES CORPORATION
1222 S. Michigan Ave., Chicago, Ill.

QUIET Aladdin *Uniform* Fuel-Oil Heat

HOUSE HEATING WITH OIL FUEL

By **P. E. FANSLER,** *Associate Editor, The Heating and Ventilating Magazine*



A representative of one of the largest oil burner manufacturers writes us:

"I have just returned from a trip on the road and find copy of "House Heating With Oil Fuel" which I requested you to mail me here, and I herewith enclose order in payment of same. I have bought all available books published on oil burning during past seven years I have been connected with development work in the field, appointing dealers for oil burners, and there has been nothing yet that approaches this book. Every oil-burner dealer owes it to himself to have a copy. I will advise all of our dealers to get a copy of this book as an absolute essential."

362 PAGES MORE THAN 150 ILLUSTRATIONS PRICE $4.00

Published by

HEATING AND VENTILATING MAGAZINE CO.
386 FOURTH AVENUE NEW YORK CITY

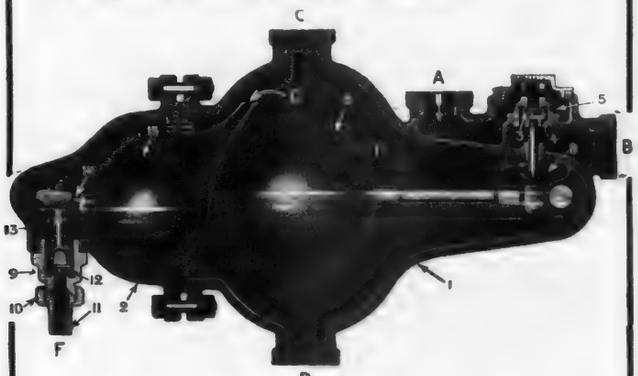
Whose Fault
when the boiler BURSTS?

Is it fair to blame it onto the owner who believed he was buying a good heating plant? Or the boiler manufacturer who provided a serviceable boiler that should last year in and year out?

Regardless of whose fault it is, the boiler burst—when it could have been positively protected by the McAlear Water Feeder.

McAlear automatic water feeders give dependable protection to Coal, Gas and Oil-fired boilers.

McAlear Water Feeders for oil burners will positively supply automatically the necessary make-up water to the boiler, and discharge all surplus water into the sewer.



The McAlear will cut out the oil burner at the low water danger point, and cut out the oil burner at any steam pressure point desired!

Complete details regarding the McAlear Direct-to-Boiler Water Feeders, including blue print showing application and roughing-in dimensions, are furnished in our Bulletin K.

Write for your copy of this bulletin today.

McALEAR

MANUFACTURING COMPANY
19th and Western
CHICAGO, ILLINOIS

Burnham Boilers

Make Every Boiler Open Its Mouth Wide and Stick Out Its Tongue

THAT'S the only way to know whether some important things are there. Is the fire pot *wide across* the top, to give the crown sheet a chance to get its share of direct heat?

Are the nipple connections inside, or are they outside the boiler, as they are in the Burnham, to take up none of the precious heat absorbing space?

Does the crown sheet itself do all it should, as this corrugated one does in the Burnham? It's three times as wide as the extra wide fire-pot under it.

Look to see if the coil hole openings are conveniently placed—two above and one below for use with tube type water heaters.

Things like that seem so simple and necessary, that you shouldn't have to ask about them. But, you know how it is, you rarely find them all taken care of in any one boiler.

You'll be interested in the very complete details of the Burnham in our new Catalog 67. Ask for it.

Burnham Boiler Corporation

IRVINGTON, N. Y.

Representatives in all principal cities of the United States and Canada.

Col. J. G. Vincent

Vice-President
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PACKARD
Motor Car Co.

Says:

"My Nokol has operated perfectly through four years of service and we have never been without heat during this time. A year ago I installed one of your new silent burners and after carefully trying it out, I wish to advise that I consider it a perfect piece of mechanism. I will always feel perfectly safe in advising my friends to equip their homes with Nokol."

There are now available a number of good territories for wide-awake dealers. If interested mail the coupon for free booklet on oil heat and details of our attractive dealer proposition.

NEW *Silent*
NO COAL
NOKOL
REG. U.S. PAT. OFF.
AUTOMATIC OIL HEATING FOR HOMES

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AMERICAN NOKOL COMPANY
4205 Schubert Ave., Chicago
Please send me your new book on oil heat and details of your dealer proposition.

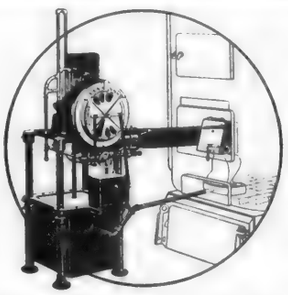
Oldest and soundest automatic oil burner manufacturer in the world.

Name.....

Address.....

City..... *State*.....

No Gas Pilot



No Electric Ignition

FREEDOM FROM SERVICE CALLS

The only flame in the McIlvaine is the oil flame. It burns continuously—it increases or decreases automatically to meet conditions.

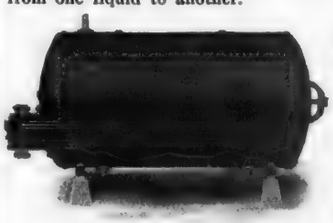
Dealers can sell the McIlvaine on this talking point alone—not to mention the many patented features found on no other burner. Listed as standard by Underwriters' Laboratories. Write for information today.

McILVAINE BURNER CORP.
Dept. H
749 Custer Ave., Evanston, Ill.

McILVAINE OIL BURNER

Alberger Buffalo Heaters

are built for a great variety of standard and special operating conditions for heating water with steam or for the interchange of heat from one liquid to another.



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HOWARD IRON WORKS **Buffalo, N. Y.**

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A COMPLETE LINE OF BRONZE AND IRON-BODY VALVES

- built for long life

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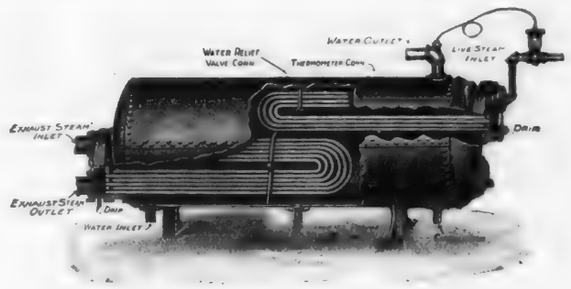
"MAXIMUM SERVICE PER DOLLAR"

The product and the Service behind it



Whitlock Heaters and Whitlock Engineering Service insure satisfaction

THE WHITLOCK COIL PIPE COMPANY
40 South St., Hartford, Conn.
New York, Boston, Philadelphia, Chicago, Baltimore, Detroit, Los Angeles, San Francisco, and other principal cities. Consult telephone book.

WHITLOCK HEAT TRANSFER PRODUCTS

The Best Boiler Needs Protection

THERMO SYPHON TRAP

For All Types of
Steam Heating Systems

A low water line does not recognize quality or efficiency in a boiler. Extreme care in selecting the boiler does not guarantee it against cracking if it does not maintain the proper water level.

This is the time of year that extra precaution should be taken. We have devoted years to the study of guarding the boiler against the ever-present danger of low water line, and have developed a product that not only protects the boiler against burning or cracking but assures proper circulation, noiseless operation and puts more life into the heating system. No air-bound or water-logged conditions.

Send for Bulletin No. 16-HV, giving full details

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HIGH GRADE
Return, Vacuum, Lifting and Separating Steam Traps
Reducing Valves Blow-off Valves
FRANKLIN, VIRGINIA

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2 Vacuum Valve

That "KELLY AIR VALVES ALWAYS MAKE WARM FRIENDS" is a well known fact. Why? For the reason, that they are the most effective valves ever designed and manufactured by us.

Simplicity of parts. Absolutely positive in action.

Compare the design of KELLY VALVES with that of other makes.

Every "KELLY" valve is subjected to a practical Steam and Vacuum test before shipping and all valves are GUARANTEED FOR FIVE YEARS.

Be convinced. Greater value for less money.

Prove what we say to your own satisfaction by comparative tests in actual service.

Manufactured by

KELLY BRASS WORKS

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Represented in most leading cities

Which?

On which do you want information? Check off those items that interest you, mail to us, and you will receive this catalog, prices, and whatever you may need in the way of information on any Atlas product.

- ☐ Reducing Valves
- ☐ Damper Regulators
- ☐ Temperature Regulators
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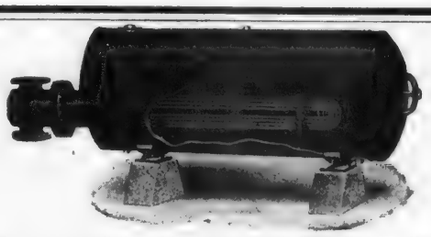
REGULATING VALVES FOR EVERY SERVICE

281 South Street, Newark, N. J.



O. E. F. U-Tube and Straight Tube heaters of flange steel make for durability—recognized by leading heating engineers.

Our engineering department is at your service and will assist you in selecting the proper sizes for various types of buildings.

O. E. Frank Heater & Engineering Co., Inc.

Factory and Offices at Buffalo, N. Y.

National No-Coil Hot Water Storage Tank

For use in Hotels, Clubs, Apartment and Public Buildings, or any place where a large amount of hot water is used.

The National No-Coil Hot Water heater supplies a large volume of water hot continuously. This is accomplished by the steam jacket which is welded to the shell of the tank. This method affords a large amount of heating surface and assures quick response. Steam jacket is properly proportioned to heat the contents of tank with steam pressure not exceeding five pounds.

Tanks are for horizontal installation, tested to hydrostatic pressure of 150 lbs. to the square inch and guaranteed for working pressure of 100 lbs.

There is a suitable size for every requirement. Let us send full details.

National Steel Tank & Mfg. Company

BRADFORD, ILLINOIS

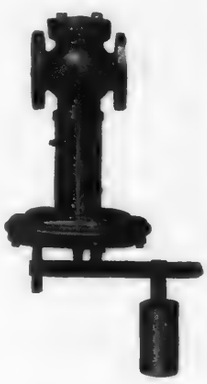
You need the 4th Ace—

to reduce steam costs!

Steam costs too much to generate to waste by inaccurate control—and for that reason many plant superintendents are specifying Mason Regulators as standard equipment.

Their dependable performance and lasting accuracy saves trouble and money.

There are Mason Regulators for *every* power and heating service, backed by an organization that has had more than 45 years' experience in the design and construction of pressure control equipment. Write for a copy of Catalog No. 62.



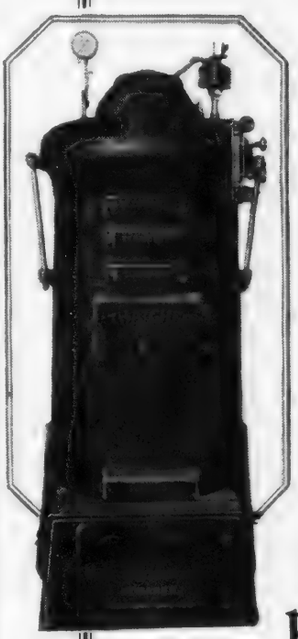
Mason No. 236 Lever Style Reducing Valve to handle reduced pressure from 0 to 10 lbs. or from 5 to 25 lbs.

Mason Regulators

MASON REGULATOR CO.
BOSTON, MASS.

1506

THATCHER
ROUND BOILER



When you sell a Thatcher you sell a boiler of *proven* performance

EACH claim made for the Thatcher Round Boiler can be easily substantiated by actual performance—a fact that makes the Thatcher one of the easiest boilers to sell.

Of the many features responsible for its proven performance, a few are:

The "Staggered fire travel" which utilizes the hot gases and smoke before entering the flue;

The quick steaming, due to the equalization of grate surface, fire travel and water circulation;

The sensitive and automatic drafts, checks and dampers which respond instantly to maintain the desired temperature.

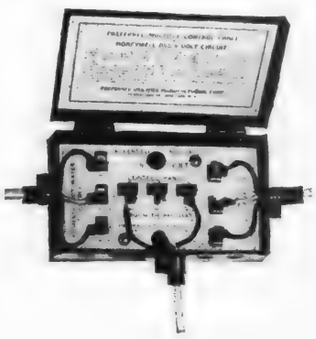
Look into the profit-making Thatcher dealer proposition. A request brings full information, together with descriptive literature.

THE THATCHER COMPANY
Since 1850

CHICAGO 341 N. Clark St. | NEWARK, N. J. 39-41 St. Francis St. | NEW YORK 21 W. 44th St.

THATCHER
BOILERS-FURNACES-RANGES

Announcing Another New Preferred Utility



Without a switch your present oil burner can now produce hot water in Spring, Summer, Winter and Fall, automatically and independently of heating the house. The Preferred 100% Automatic Hot Water Control Panel will give your customers predetermined hot water without heating the house in the Summer, or without affecting the desired house temperature in the Winter.

Write us for full description and prices of this new Preferred Utility which is now available for use with all low voltage control on steam or vapor systems.

Preferred Utilities:

Preferred 100% Automatic Damper
Preferred Foot Valves
Preferred Anti-Syphon Valve
Preferred Double Tapped Bushings
Preferred Flush Boxes
Preferred Vent Protector
Preferred Domestic Hot Water Control Panel

Other Preferred Utilities in our laboratory and on test in the field.

PREFERRED UTILITIES MANUFACTURING CORP.
33 West 60th St., New York, N. Y.

QUALITY **SIMPLICITY**

REGISTERED KIELEY TRADE MARK

STEAM—WATER AND AIR SPECIALTIES

Regulating Valves

that have met every pressure-controlling requirement.

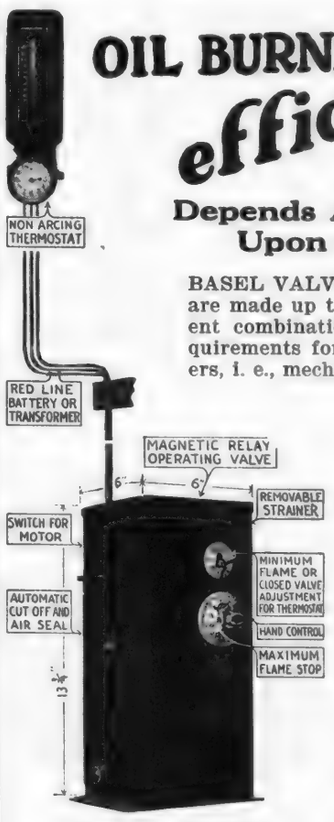
An all-inclusive statement, but remember that Kieley has specialized on Regulating and Reducing Valve Service for Heating Systems and Power Plants for 50 years.

The Rockaway Valve shown is one of several types. Send for the No. 57 Catalogue.

KIELEY & MUELLER, Inc.
34 West 13th Street **NEW YORK CITY**

OIL BURNER *efficiency!*

Depends Almost Entirely Upon the Control



Types E-2 and E-3 Heat Regulators

BASEL VALVES and Heat Regulators are made up to work out in five different combinations. They meet all requirements for both types of oil burners, i. e., mechanical and natural draft.

They are Automatic. They are Frictionless. They are Packingless. The increased demand for Basel Products is the reason for our lowered prices.

Our staff of engineers will assist you as to the particular control suited to the type of oil burner that you are using.

BASEL MFG. CO., Inc.
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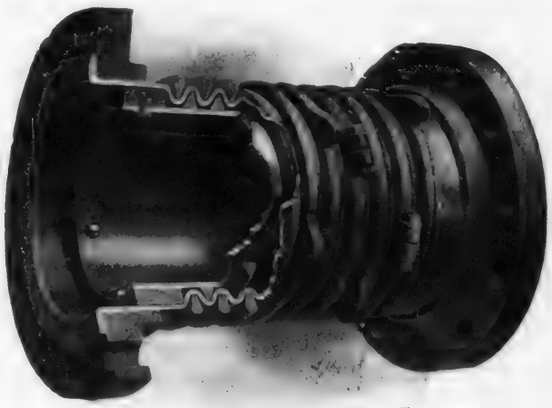
The Expansion Joint
for District Heating Systems



Wainwright Improved Expansion Joint

THE Wainwright Expansion Joint is ideally adapted to low and medium pressure steam pipes. (Up to 125 lbs. per sq. in.) It occupies no more space than an equivalent length of straight pipe, and may be inserted anywhere within the line. The Wainwright Joint has no packing, expansion being taken up by a seamless, corrugated copper tube. Long life is insured by inside and outside equalizing rings which distribute the movement between the different corrugations of the copper, so that each corrugation takes its share of the expansion, and no one corrugation is over-stressed. An inside protecting sleeve permits passage of the steam or liquid without turbulence and without danger of erosion to the copper expansion member.

For types and sizes, write for Bulletin No. 46

Foster Wheeler Corporation

A Consolidation of Power Specialty Company and Wheeler Condenser and Engineering Company

165 Broadway, New York, N. Y.

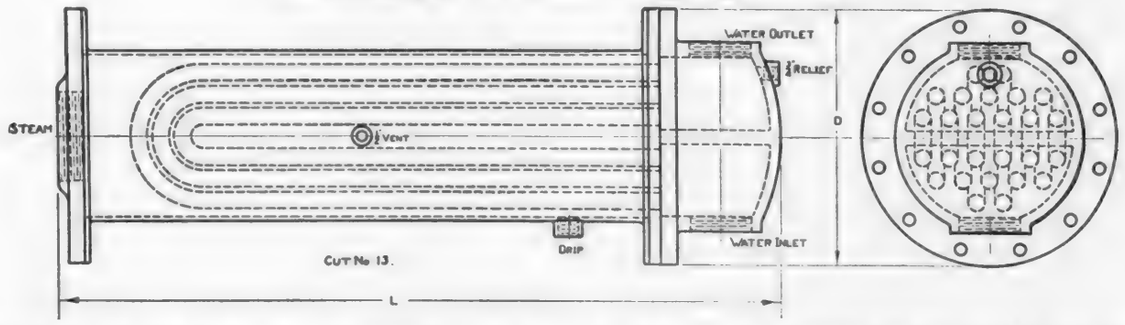
Branches in All Principal Cities.

115

NATIONAL

PREHEATERS or U BEND TYPE Condensation Coolers

soon pay for themselves in saving heat lost through discharge of heating systems



Much heat is lost in allowing the condensation discharge from the heat you buy to pass off into the sewer. By using a National Preheater or Condensation Cooler, the condensation passes through the heater where the U bend element extracts the heat still in the condensation and uses it for domestic hot water supply. You also eliminate trouble resulting from high temperature condensation emptying into the sewage system.

Furnished in All Sizes. Write for Quotations.

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AND
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NON-RISING STEM
AND
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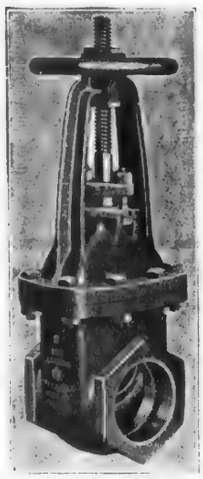

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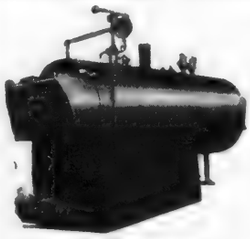

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You take no chance in buying COATESVILLES because they're backed by over 40 YEARS' BOILER MAKING EXPERIENCE.

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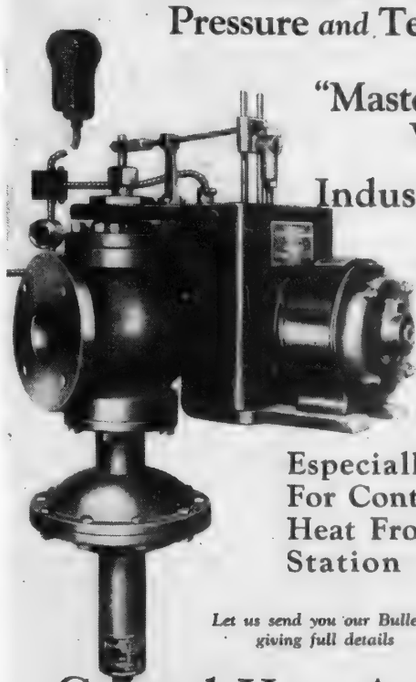
Pressure *and* Temperature
2 in 1
"Master Control" Valve
(PATENTED)
Industrial Type



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All Relays Eliminated ... ...

Especially Designed For Control of Steam Heat From a Central Station

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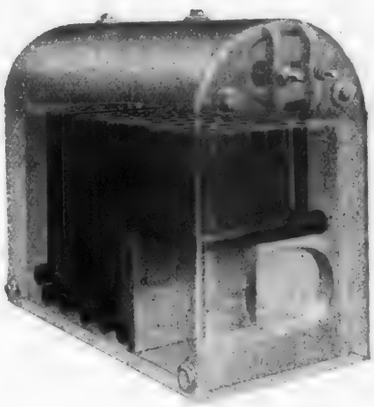
Electric Welded Steel Heating Boiler



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1. Designed and built primarily and exclusively for oil fuel.
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5. Vertical, straight-line circulation.
6. Any type of domestic oil burner.
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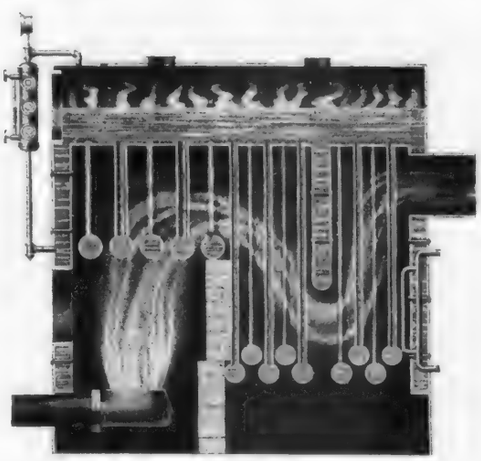

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By a certain Oil Burner Manufacturer shows

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In our own laboratory we have obtained more.

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It is hard to determine the maximum, as the one way water travel giving the most rapid water circulation it is possible to obtain repeats so fast that the efficiency of your fire is the governing factor.

Truly a Wonderful Boiler

Manufactured by

BRYAN STEAM CORPORATION

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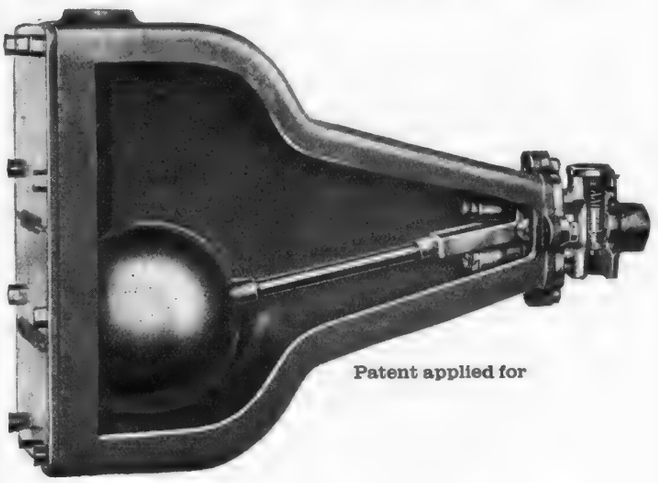
THERMOFLEX No. 2 DUPLEX AUTOMATIC BOILER FEEDER



Patent applied for

Positive and economical control of the water line of low pressure steam boilers. Inlet and overflow are controlled by one float.

For boilers using all types of fuel but particularly for those using gas and oil.

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the Lagging Product that You Manufacture

Let us make it on a royalty basis and put a national selling force back of it.

We are one of the oldest, most reliable, straightforward manufacturers in the steam specialty business, and are regular exhibitors at the New York and Chicago Power Shows. Our offer is bona fide.

We are looking for additional power plant and heating specialties to market with our excellent national sales force, and if you have a product in our line which you are having difficulty in marketing, write us at

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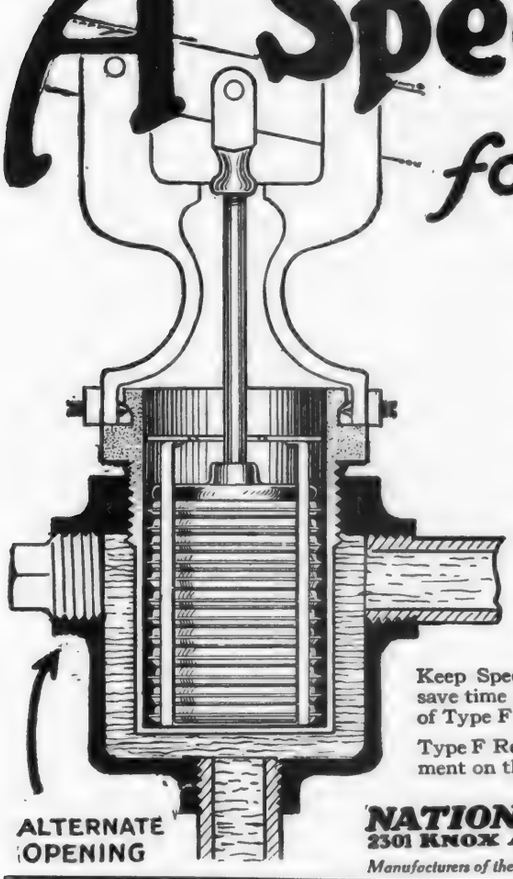
Heating & Ventilating Magazine

386 Fourth Ave., New York, N. Y.

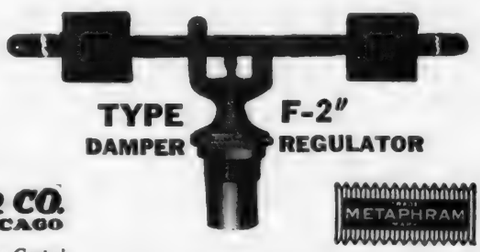
A Special Fitting for Type F DAMPER REGULATOR



Used where no 2″ opening in boiler is available. The Special Fitting for Type F (shown in black) takes the place of a "Y" fitting, greatly simplifying installation. Has three threaded openings, the two best suited being used and the third plugged, making it adaptable to any location.

Keep Special Fittings in stock; they save time on all pipe line installations of Type F Damper Regulators.

Type F Regulators are standard equipment on the better boilers.



METAPHRAM

NATIONAL REGULATOR CO.
2301 KNOX AVENUE CHICAGO
Manufacturers of the National System of Automatic Temperature Control

"We keep others in Hot Water"

Repeat Orders Reflect Satisfactory Service

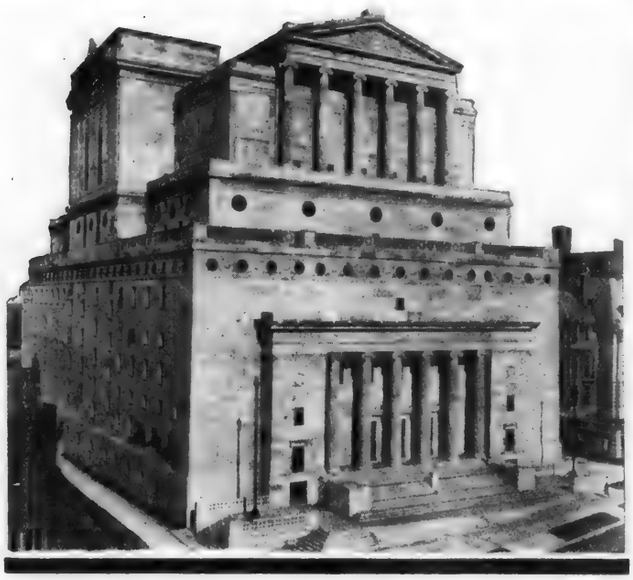
Note the following copy of sales record:

Endicott-Johnson Co.,
Endicott, N. Y.

September, 1916	2	storage heaters
June, 1917	2	" "
June, 1921	2	" "
October, 1921	1	" "
March, 1923	2	" "
April, 1923	1	" "
November, 1924	1	" "
January, 1925	1	" "
December, 1926	2	" "
Total	14	storage heaters.

FURNISHED BY

THE SIMS COMPANY, Erie, Penna.



Masonic Temple Has SARCO Radiator Traps

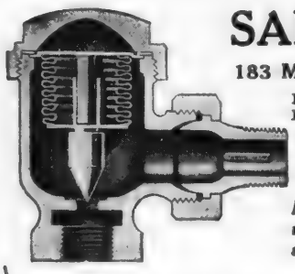
In St. Louis the Masonic Temple is an outstanding example of architectural effect. Throughout the equipment is the most modern.

To insure winter comfort, The Sodeman Heat & Power Co., heating contractors, installed Sarco Radiator Traps.

The life of the Sarco expansion element is greater than that of flat diaphragms, soldered discs or of annularly corrugated bellows, owing to the unique helical construction and the extra heavy bronze tubing with deep corrugations. No type of motor element can be made in which the metal is less stressed in operation.

Thermostatic elements are filled under vacuum. When cold, the motor element in the trap is collapsed about ⅛" and when heated by the steam it travels this distance and expands an additional ⅛". Thus, for total movement of ¼", the metal stress is cut down 50%. This insures a wide movement of the valve which, in opening, provides, at all times, a perfectly free discharge.

The large diameter of the thermostatic element and the carefully proportioned expansion fluid used, guarantee maximum closing pressure, perfect seating and a positively tight valve, permitting no steam or vapor to enter the return.



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Let us figure on complete equipment for your vapor and vacuum systems. Send for Booklet P-144

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THE DESIGN OF GRAVITY-CIRCULATION WATER HEATING SYSTEMS, by F. E. Giesecke, Ph. D. A book, remarkable for its conciseness and clearness of expression, which contains the essence of the information needed for the proper design of gravity water heating systems, based on the principle that the frictional resistance must equal the force maintaining flow. The importance of the presentation is evidenced by the fact that the entire water heating section of the A. S. H. & V. E. Compendium of Modern Practice has been discarded and replaced with a new section by Doctor Giesecke, embodying the methods here presented in detail. 64 pages of text and 10 pages of tables and charts. Price, $3.00.

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THE HEATING and VENTILATING MAGAZINE
386 FOURTH AVE., NEW YORK

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Patterson Hot Water Heaters

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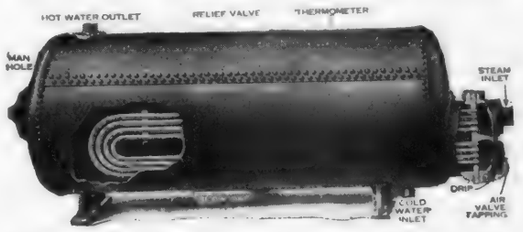
In selecting Patterson Hot Water Heaters these men followed the example of most of the country's architects and engineers who handle large, important projects. For you'll find the Patterson in a big percentage of the important buildings.

If you want dependable hot water service, play safe and specify the "Patterson"—the hot water heater backed by an iron-bound guarantee to deliver all the hot water required, as hot as required and as quickly as required.

Let us send you a list of installations and catalogs.



The Patterson-Kelley Co.
107 East 40th St., New York, N. Y.

Radiator Valves

Fig. 853
Low Bonnet Angle, male union

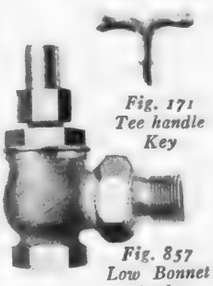


Fig. 171
Tee handle Key

Fig. 857
Low Bonnet Angle, Lock Shield
(Fig. 856, Globe)

Fig. 862
Low Bonnet Regular Corner, R. H., male union

Fig. 866
Low Bonnet Offset Corner, R. H., male union

Since compactness and small dimensions are assuming a greater and greater importance in modern radiator equipment, a new line of Jenkins Valves has been developed to meet these new needs fully. Jenkins Low Bonnet Valves, furnished in several types, combine compact design with handsome appearance and strength to withstand pipe strains. The manganese bronze spindle has double threads so the valve can be opened by approximately one turn of the hand wheel.

These valves, along with the standard patterns so widely used for many years afford a range of choice which makes possible the selection of the correct valve for each type of job.

Jenkins supplies for vacuum heating systems the Jenkins Modulating Valve and the Jenkins Thermostatic Return Trap.

Folder No. 116 illustrates 34 types of Jenkins Radiator Valves. It will pay you to know the complete line.

Jenkins Valves are known by the Diamond Mark and Jenkins Bros. signature. To avoid substitution, may we suggest your specifications mention these symbols as well as the valve figure numbers?

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Jenkins Valves
SINCE 1864

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Powers Regulator Co., Chicago, Ill.
Spencer Turbine Co., The, Hartford, Conn.

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Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Gorton Heating Corporation, New York.
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Spencer Heater Co., Williamsport, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Thatcher Co., The, Newark, N. J.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.

BOILERS, MAGAZINE FEED
Gorton Heating Corporation, New York.
Molby Boiler Co., New York.
Spencer Heater Co., Williamsport, Pa.

BOILERS, OIL-FIRED
Bryan Steam Corp., Peru, Ind.
Johnston Brothers, Inc., Ferrysburg, Mich.

BOILERS, POWER
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Heggie-Simplex Boiler Co., Joliet, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Orr & Sembower, Inc., Reading, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

CALORIMETERS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.

COILS, PIPE
Bayley Blower Co., Milwaukee, Wis.
Buffalo Forge Co., Buffalo, N. Y.
Clow & Sons, James B., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

CONCRETE INSERTS
Gleeckle, Jr., A. F., Rochester, N. Y.

CONDENSERS
Davis Engineering Corp., New York.
Foster Wheeler Corporation, Carteret, N. J.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

CONVERTERS, HOT WATER
Davis Engineering Corp., New York.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLERS, AIR
Alberger Heater Co., Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.

COOLERS, OIL
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Whitlock Coil Pipe Co., Hartford, Conn.

COOLING TOWERS & PONDS
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

COPPER BOILERS
Badger & Sons Co., E. B., Boston, Mass.

COPPER KETTLES
Badger & Sons Co., E. B., Boston, Mass.

COVERING, BOILER, PIPE, ETC.
American District Steam Co., North Tonawanda, N. Y.
Banner Rock Products Co., Alexandria, Ind.
Ric-wiL Co., The, Cleveland, Ohio.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT
Buckeye Blower Co., The, Columbus, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DEHUMIDIFYING APPARATUS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
General Air Filters Corp., New York.
Johnson Service Co., Milwaukee, Wis.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

DISTILLERS, (WATER)
Badger & Sons Co., E. B., Boston, Mass.
Davis Engineering Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

DRYING SYSTEMS
(See Air Cooling & Drying Systems).

DUST COLLECTING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Midwest Air Filters, Inc., Bradford, Pa.
Pecco, Inc., St. Louis, Mo.
Reed Air Filter Co., Inc., Louisville, Ky.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST COLLECTORS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Pecco, Inc., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Spencer Turbine Co., The, Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
York Heating & Ventilating Corp., Phila., Pa.

ENGINES, STEAM, AUTOMATIC
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

ENGINES, STEAM, HIGH SPEED
American Blower Co., Detroit, Mich.
Brownell Co., The, Dayton, Ohio.
Clarage Fan Co., Kalamazoo, Mich.
Frost Mfg. Co., Galesburg, Ill.
Pierce, Butler & Pierce Mfg. Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS
Hoffman Specialty Co., New York.
Sarco Co., Inc., New York.

EVAPORATORS, BOILER FEED MAKE-UP
Buffalo Forge Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
National Pipe Bending Co., New Haven, Conn.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.

EXHAUST HEADS
Aeolus Dickinson Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Swartwout Co., The, Cleveland, Ohio.

EXHAUST SYSTEMS
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EXPANSION JOINTS
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Central Station Steam Co., Detroit, Mich.
Foster Wheeler Corporation, Carteret, N. J.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.

EXPANSION SHELLS
Phillips Drill Co., Chicago, Ill.

FANS, DISC PRESSURE
DeBothezat Impeller Co., Inc., New York.

FANS, SUPPLY AND EXHAUST
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Emerson Electric Mfg. Co., St. Louis, Mo.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

FEEDERS, BOILER
Cashin Co., W. D., Boston, Mass.
Cissell Mfg. Co., W. M., Louisville, Ky
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

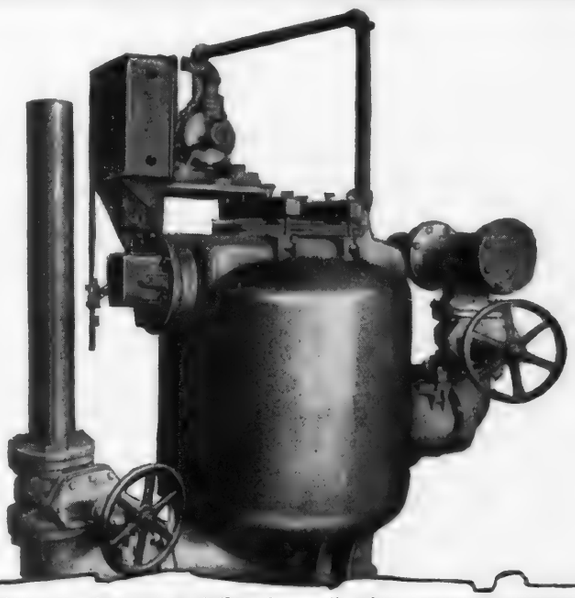
FILTERS, (AERATING)
Davis Engineering Corp., New York.

FILTERS, FEED-WATER
Davis Engineering Corp., New York.

FITTINGS, DISTRIBUTOR
Blake Specialty Co., Rock Island, Ill.

FITTINGS, FLANGED
Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.

FLANGES
Clow & Sons, James B., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Powell Co., Wm., The, Cincinnati, Ohio.



Furthermore, because it differs from all other pneumatic ejectors, this equipment operates without a complicated air valve mechanism, without an air storage tank and without the conventional reciprocating compressor and its accessories. Air is supplied only when sewage is actually being moved. No high pressure air is required or stored and perhaps permitted to leak even when the unit is not pumping. Air volume is always available to operate indefinitely at the maximum rate

"---because it differs---"

From Bulletin No. 67 Jennings Sewage Ejector

The Jennings Sewage Ejector *is* different. So much so that it marks a distinct advance in pneumatic equipment of this kind for handling sewage and other heavy liquids.

You will find this ejector simple in operation. There are no complicated mechanisms likely to get out of order. No intricate air valves, no inaccessible parts.

Supplied in standard sizes having capacities up to 1500 g.p.m. Heads up to 50 ft. Bulletin No. 67 is the one to write for.

NASH ENGINEERING COMPANY

81 Wilson Road SO. NORWALK, CONN.

Jennings Pumps

GAS BURNERS
Cleveland Gas Burner & Appliance Co., Cleveland, Ohio.

GASKETS, ASBESTOS
Jenkins Bros., New York.

GASKETS, METALLIC
Jenkins Bros., New York.

GASKETS, RUBBER
Jenkins Bros., New York.

GAUGE BOARDS
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Clow & Sons, James B., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGE GLASSES
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
Powell Co., Wm., The, Cincinnati, Ohio.

GAUGES, ALTITUDE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
United States Radiator Corp., Detroit, Mich.

GAUGES, DRAFT
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, HYDRAULIC
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

GAUGES, OUNCE GRADUATED
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, PRESSURE
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

GAUGES, VACUUM
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, VACUUM (COMPOUND)
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Pierce, Butler & Pierce Mfg. Corp., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.
Webster & Co., Warren, Camden, N. J.

GAUGES, WATER
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
National Radiator Corp. Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.

GENERATOR COOLING SYSTEMS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Reed Air Filter Co., Inc., Louisville, Ky.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

GOVERNORS, (PUMP)
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Webster & Co., Warren, Camden, N. J.

GRATES, DUMPING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Co., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio
Titusville Iron Works Co., The, Titusville, Pa

GRATES, ROCKING
Kewanee Boiler Co., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.

GRATES, SHAKING
Fitzgibbons Boiler Co., Inc., New York.
Kewanee Boiler Co., Kewanee, Ill.
Page Boiler Co., Wm. H., New York.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING AND DUMPING
Frost Mfg. Co., Galesburg, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, SHAKING, CIRCULAR
Fitzgibbons Boiler Co., Inc., New York.
Pyramid Iron Products Corp., New York.
Titusville Iron Works Co., The, Titusville, Pa.

GRATES, STATIONARY
Fitzgibbons Boiler Co., Inc., New York.
Frost Mfg. Co., Galesburg, Ill.
Pyramid Iron Products Corp., New York.
Stanwood Corporation, Cincinnati, Ohio.
Titusville Iron Works Co., The, Titusville, Pa.

GRILLES
Metalace Corporation, Boston, Mass.

HEAT CABINETS
Circulair Heat, Inc., Louisville, Ky.
Clow & Sons, James B., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
Reed Air Filter Co., Inc., Louisville, Ky.
Trane Co., The, LaCrosse, Wis.

HEATERS, AIR, FAN SYSTEM
Aerofin Corp., Newark, N. J.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
National Air Filter Co., Chicago, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Rome-Turney Radiator Co., Rome, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

HEATERS, DOMESTIC WATER
Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Blake Specialty Co., Rock Island, Ill.
Davis Engineering Corp., New York.
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Illinois Malleable Iron Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Mears-Kane-Ofeldt, Inc., Philadelphia, Pa.
Molby Boiler Co., New York.
Monitor Boiler Co., Philadelphia, Pa.
National Pipe Bending Co., New Haven, Conn.
National Steel Tank & Mfg. Co., Bradford, Ill.
Page Boiler Co., Wm. H., New York.
Patterson-Kelley Co., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., The, Erie, Pa.
Thatcher Co., The, Newark, N. J.
Thermal Appliance Co., New York.
Titusville Iron Works Co., The, Titusville, Pa.
United States Radiator Corp., Detroit, Mich.
Weil-McLain Co., Chicago, Ill.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, ELECTRICAL UNIT
American Blower Co., Detroit, Mich.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.

HEATERS, FEED WATER, (CLOSED)
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York.
Foster Wheeler Corporation, Carteret, N. J.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
Frost Mfg. Co., Galesburg, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, FEED WATER, (OPEN)
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Stanwood Corporation, Cincinnati, Ohio.
Webster & Co., Warren, Camden, N. J.

HEATERS, FUEL-OIL
Alberger Heater Co., Buffalo, N. Y.
Davis Engineering Corp., New York
Excelso Products Corporation, Buffalo, N. Y.
Frank Heater & Engineering Co., O. E., Buffalo, N. Y.
National Air Filter Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Schutte & Koerting Co., Philadelphia, Pa.
Thermal Appliance Co., New York.
Titusville Iron Works Co., The, Titusville, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

HEATERS, UNIT
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
Modine Mfg. Co., Racine, Wis.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Stickle Steam Specialties Co., Indianapolis, Ind.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.
York Heating & Ventilating Corp., Phila., Pa.

HEATING SYSTEMS, GAS
Clow & Sons, James B., Chicago, Ill.

HEATING SYSTEMS, VACUUM
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

HEATING SYSTEMS, VAPOR
American District Steam Co., North Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Spencer Heater Co., Williamsport, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J

HEATING SYSTEMS, WATER
American Radiator Co., Buffalo, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Grinnell Co., Providence, R. I.
Hornung, J. C., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Spencer Heater Co., Williamsport, Pa
Thatcher Co., The, Newark, N. J.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

HUMIDIFIERS
American Blower Co., Detroit, Mich.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
General Air Filters Corp., New York.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
Midwest Air Filters, Inc., Bradford, Pa.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Seymour, James M., Newark, N. J.
York Heating & Ventilating Corp., Phila., Pa.

HUMIDITY CONTROL
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Carrier Engineering Corp., Newark, N. J.
Foxboro Co., Inc., The, Foxboro, Mass.
Grinnell Co., Providence, R. I.
Johnson Service Co., Milwaukee, Wis.
National Air Filter Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.

INSTRUMENTS, ELECTRIC MEASURING
Bristol Co., The, Waterbury, Conn.

INSTRUMENTS, INDICATING AND RECORDING
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Temperature Indicating Co., Toledo, Ohio.
Bristol Co., The, Waterbury, Conn.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.

INSULATION, BOILER, PIPE, ETC.
(See Covering, Boiler, Pipe, etc.)

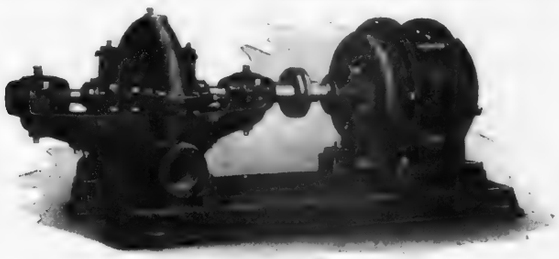
INSULATION, BUILDING
Insulite Co., Minneapolis, Minn.

MANOMETERS
American Blower Co., Detroit, Mich.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Foxboro Co., Inc., The, Foxboro, Mass.

MECHANICAL DRAFT APPARATUS
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
DeBothezat Impeller Co., Inc., New York
Mason Regulator Co., Boston, Mass.
New York Blower Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wing Mfg. Co., L. J., New York.

METALS, THERMOSTATIC
Chace Valve Co., W. M., Detroit, Mich.

METERS, CONDENSATION
American District Steam Co., North Tonawanda, N. Y.
Central Station Steam Co., Detroit, Mich.



If you want
Absolute Reliability

If the service needs a pump that's really built right to operate day in and day out and year after year without much attention and with a minimum of repair, specify a "Buffalo" Class "S" general service pump.

It's backed by 40 years of engineering experience and has earned for itself a noteworthy record on repeat orders.

"Buffalo" engineers will be glad to show what the correct size and type of Class "S" will do in meeting your pump requirements.

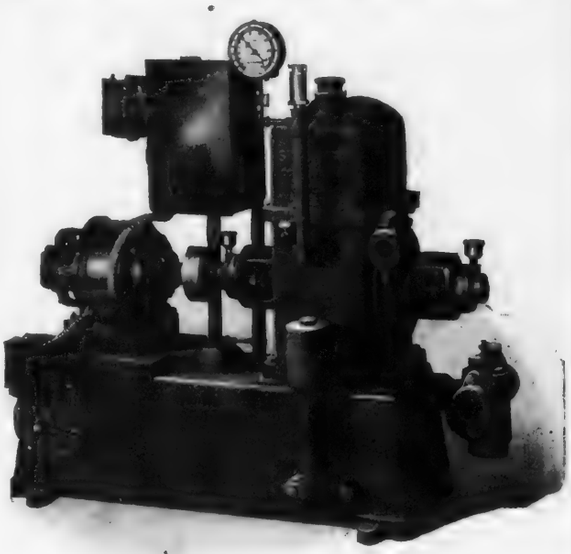
5 Points of Reliability in "Buffalo" Class "S" Pumps

1. Double suction, hydraulically balanced impeller.
2. Horizontally divided casing, making inspection and adjustment easy.
3. Best of materials, carefully machined and fitted. Extra deep stuffing boxes, bronze clearance rings, bronze water seals. Bronze impellers and shafts where water temperatures require.
4. Bronze bushed, ring-oiling bearings to reduce wear and maintain continued high efficiency.
5. Can be built for right or left hand rotation, and for motor or pulley drive.
6. Every pump tested before leaving factory, insuring actual performances on the job.

Buffalo Steam Pump Co.
480 Broadway Buffalo, N. Y.
In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" Class "S" Pumps

SKIDMORE



Which Will You Have

high or low water line in the system when operating on float control?

The Skidmore pump on interceptor base is designed to give low water line operation without pitting.

The unit is self contained, ball bearing, and operated by one motor. It produces vacuum on the system even when operating on float control, a desirable feature.

The unit consists of two pumps in one housing on one shaft, an air pump and a centrifugal pump for boiler feed. Motor and pump are mounted directly on interceptor base. This construction means compactness in design and minimum floor space occupied.

The automatic starter together with vacuum regulator and float switch are mounted on this unit. All wiring is installed at the factory.

Bulletin No. 5 illustrating this unit is now available.

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120 Prince Street, Montreal

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Webster & Co., Warren, Camden, N. J.

METERS, FLOW
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Spray Engineering Co., Boston, Mass.

METERS, PITOT TUBE
American Blower Co., Detroit, Mich.
Buffalo Forge Co., Buffalo, N. Y.

METERS, STEAM
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Spray Engineering Co., Boston, Mass.
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Young Pump Co., Chicago, Ill.

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Hardinge Bros., Inc., Chicago, Ill.
Johnson Co., S. T., Oakland, Cal.
Laco Gas Burner Co., Griswold, Iowa.
McIlvaine Burner Corporation, Chicago, Ill.
Nu-Way Corporation, Rock Island, Ill.
Petroleum Heat & Power Co., New York.
Sundstrand Engineering Co., Rockford, Ill.
Williams Oil-O-Matic Heating Corp., Bloomington, Ill.

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Buffalo Forge Co., Buffalo, N. Y.
Grant Accessories Corp., New York.
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Johnston Brothers, Inc., Ferrysburg, Mich.
Monroe Machine Tool Co., Chicago, Ill.
Preferred Utilities Mfg. Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster Electric Co., Racine, Wis.

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Basel Mfg. Co., The, Kansas City, Mo.
Federal Gauge Co., The, Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.
Webster Electric Co., Racine, Wis.

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Higgin Mfg. Co., Newport, Ky.

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Clow & Sons, James B., Chicago, Ill.

PIPE, STEEL
Clow & Sons, James B., Chicago, Ill.
National Tube Co., Pittsburgh, Pa.

PIPE, WOOD
Wyckoff & Son Co., A., Elmira, N. Y.

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Clow & Sons, James B., Chicago, Ill.
Grinnell Co., Providence, R. I.
National Pipe Bending Co., New Haven, Conn.
Whitlock Coil Pipe Co., Hartford, Conn.

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Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
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General Air Filters Corp., New York.
Monroe Machine Tool Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.
Young Pump Co., Chicago, Ill.

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Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
Young Pump Co., Chicago, Ill.

PUMPS, OIL
Monroe Machine Tool Co., Chicago, Ill.

PUMPS, ROTARY
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, STEAM
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

PUMPS, TURBINE
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Economy Pumping Machinery Co., Chicago, Ill.
Foster Wheeler Corporation, Carteret, N. J.
Nash Engineering Co., So. Norwalk, Conn.
Trane Co., The, LaCrosse, Wis.

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Dunham Co., C. A., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Monroe Machine Tool Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., The, LaCrosse, Wis.
Young Pump Co., Chicago, Ill.

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American Metal Products Corp., St. Louis, Mo.

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Grinnell Co., Providence, R. I.
Hartmann Co., Charles, Brooklyn, N. Y.
Healy-Ruff Co., St. Paul, Minn.
Kewanee Boiler Co., Kewanee, Ill.
McAlear Mfg. Co., Chicago, Ill.
United States Radiator Corp., Detroit, Mich.

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Circulair Heat, Inc., Louisville, Ky.
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Shaw-Perkins Mfg. Co., Pittsburgh, Pa.

RADIATORS, GAS HEATED
Clow & Sons, James B., Chicago, Ill.

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Clow & Sons, James B., Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.
Moiby Boiler Co., New York.
National Radiator Corp., Johnstown, Pa.
Nelson Corp., Herman, The, Moline, Ill.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Thatcher Co., The, Newark, N. J.
United States Radiator Corp., Detroit, Mich.

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Brownell Co., The, Dayton, Ohio.
Frost Mfg. Co., Galesburg, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

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American District Steam Co., North Tonawanda, N. Y.
American Steam Pump Co., Battle Creek, Mich.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Titusville Iron Works Co., The, Titusville, Pa.
Trane Co., The, LaCrosse, Wis.
Vapor Engineering Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.
Young Pump Co., Chicago, Ill.

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Cissell Mfg. Co., W. M., Louisville, Ky.
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McAlear Mfg. Co., Chicago, Ill.
McDonnell & Miller, Chicago, Ill.

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Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Regulator Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
Wing Mfg. Co., L. J., New York.

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Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.

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(See Temperature Control).

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Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Patterson-Kelley Co., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Webster & Co., Warren, Camden, N. J.

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American District Steam Co., North Tonawanda, N. Y.
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Illinois Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Sims Co., The, Erie, Pa.
Swartwout Co., The, Cleveland, Ohio.
Webster & Co., Warren, Camden, N. J.

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Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
General Air Filters Corp., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Seymour, James M., Newark, N. J.

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(See Nozzles, Spray).

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Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Monroe Machine Tool Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

STRAINERS, STEAM
American District Steam Co., North Tonawanda, N. Y.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.

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Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Spray Engineering Co., Boston, Mass.

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American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
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Basel Mfg. Co., The, Kansas City, Mo.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Carrier Engineering Corp., Newark, N. J.
Federal Gauge Co., The, Chicago, Ill.
Foxboro Co., Inc., The, Foxboro, Mass.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Pyramid Iron Products Corp., New York.
Sarco Co., Inc., New York.
Sterling Engineering Co., Milwaukee, Wis.
Thrush & Co., H. A., Peru, Ind.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich.

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American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
American Temperature Indicating Co., Toledo, Ohio.
Bristol Co., The, Waterbury, Conn.
Foxboro Co., Inc., The, Foxboro, Mass.
Marsh & Co., Jas. P., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powers Regulator Co., Chicago, Ill.
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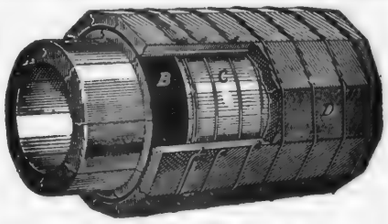

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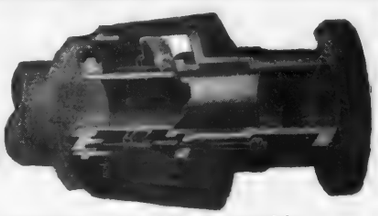

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National Regulator Co., Chicago, Ill.
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United States Radiator Corp., Detroit, Mich.

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Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

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Bishop & Babcock Sales Co., Cleveland, Ohio.
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Clow & Sons, James B., Chicago, Ill.
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Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
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Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
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Lytton Mfg. Corp., Franklin, Va.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Sterling Engineering Co., Milwaukee, Wis.
Swartwout Co., The, Cleveland, Ohio.
Trane Co., The, LaCrosse, Wis.
Webster & Co., Warren, Camden, N. J.

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Wyckoff & Son Co., A., Elmira, N. Y.

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Sturtevant Co., B. F., Hyde Park, Boston, Mass.

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Kelly Brass Works, Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
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Russell & Co., W. A., New York.
United States Radiator Corp., Detroit, Mich.

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Gorton Heating Corporation, New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Sarco Co., Inc., New York.
Scott Valve Mfg. Co., Detroit, Mich.
Trane Co., The, LaCrosse, Wis.

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Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

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Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, BLOW-OFF

Jenkins Bros., New York.
Lytton Mfg. Corp., Franklin, Va.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.

VALVES, CHECK

Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Milwaukee Valve Co., Milwaukee, Wis.
Powell Co., Wm., The, Cincinnati, Ohio.
Schutte & Koerting Co., Philadelphia, Pa.
Walworth Co., New York.

VALVES, FLOAT

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago. Ill.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Schutte & Koerting Co., Philadelphia, Pa.

VALVES, GATE

American District Steam Co., North Tonawanda, N. Y.
Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.
Walworth Co., New York.

VALVES, GLOBE, ANGLE & CROSS

Grinnell Co., Providence, R. I.
Illinois Malleable Iron Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Schutte & Koerting Co., Phila., Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Walworth Co., New York.

VALVES, HYDRAULIC-OPERATING

Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
Powell Co., Wm., The, Cincinnati, Ohio.

VALVES, MAGNETIC

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.

VALVES, NON-RETURN

Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Grinnell Co., Providence, R. I.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.

VALVES, RADIATOR

American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Capitol Brass Works, Detroit, Mich.
Cashin Co., W. D., Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Gorton Heating Corporation, New York.
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
Milwaukee Valve Co., Milwaukee, Wis.
National Radiator Corp., Johnstown, Pa.
Page Boiler Co., Wm. H., New York.
Pierce, Butler & Pierce Mfg. Corp., New York.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.
Schutte & Koerting Co., Philadelphia, Pa.
Scott Valve Mfg. Co., Detroit, Mich.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., The, LaCrosse, Wis.
United States Radiator Corp., Detroit, Mich
Vapor Engineering Co., New York.
Webster & Co., Warren, Camden, N. J.

VALVES, REDUCING

(See Regulators, Pressure).

VALVES, REGULATING

Atlas Valve Co., Newark, N. J.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Bristol Co., The, Waterbury, Conn.
Davis Regulator Co., G. M., Chicago, Ill.
Fulton Sylphon Co., Knoxville, Tenn.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kieley & Mueller, Inc., New York.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
Powell Co., Wm., The, Cincinnati, Ohio.
Powers Regulator Co., Chicago, Ill.
Sarco Co., Inc., New York.

VALVES, RELIEF (WATER)

American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Davis Regulator Co., G. M., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg. Co., Chicago, Ill.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.
Thrush & Co., H. A., Peru, Ind.
United States Radiator Corp., Detroit, Mich.

VALVES, SAFETY

Absolute Con-Tac-Tor Corp., Elkhart, Ind.
American District Steam Co., North Tonawanda, N. Y.
American Radiator Co., Buffalo, N. Y.
American Schaeffer & Budenberg Corp., Brooklyn, N. Y.
Jenkins Bros., New York.
National Radiator Corp., Johnstown, Pa.
Powell Co., Wm., The, Cincinnati, Ohio.
Scott Valve Mfg. Co., Detroit, Mich.
United States Radiator Corp., Detroit, Mich.

VALVES, STOP AND CHECK

(See Valves, Non-Return).

VENTILATING SYSTEMS

American Blower Co., Detroit, Mich.
American Radiator Co., Buffalo, N. Y.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Blower Co., Milwaukee, Wis.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corp., Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
General Air Filters Corp., New York.
Ilg Electric Ventilating Co., Chicago, Ill.
Johnson Fan & Blower Co., Chicago, Ill.
Lakeside Company, The, Hermansville, Mich.
Nelson Corp., Herman, The, Moline, Ill.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS

Bayley Blower Co., Milwaukee, Wis.
DeBothezat Impeller Co., Inc., New York
Midwest Air Filters, Inc., Bradford, Pa.
Seymour, James M., Newark, N. J.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VENTILATORS, MUSHROOM

Aeolus Dickinson Co., Chicago, Ill.
American Blower Co., Detroit, Mich.
American Metal Products Corp., St. Louis, Mo.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Knowles Mushroom Ventilator Co., New York.
Ventilating Products Co., Chicago, Ill

VENTILATORS, ROOF

Aeolus Dickinson Co., Chicago, Ill.

VENTILATORS, UNIT

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bishop & Babcock Sales Co., Cleveland, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
DeBothezat Impeller Co., Inc., New York
Dwyer Equipment Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Nelson Corp., Herman, The, Moline, Ill.
New York Blower Co., Chicago, Ill.
Pecco, Inc., St. Louis, Mo.
Peerless Unit Ventilation Co., Inc., New York.
Sinclair Equipment Corp., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

WATER STERILIZERS

Clow & Sons, James B., Chicago, Ill.

WEATHER STRIPS, METAL

Athey Co., Chicago, Ill.
Higgin Mfg. Co., Newport, Ky.

WELDERS, ELECTRIC ARC

Lincoln Electric Co., Cleveland, Ohio.

WRENCHES, STILLSON

Walworth Co., New York.

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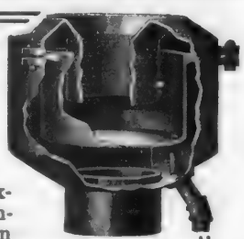

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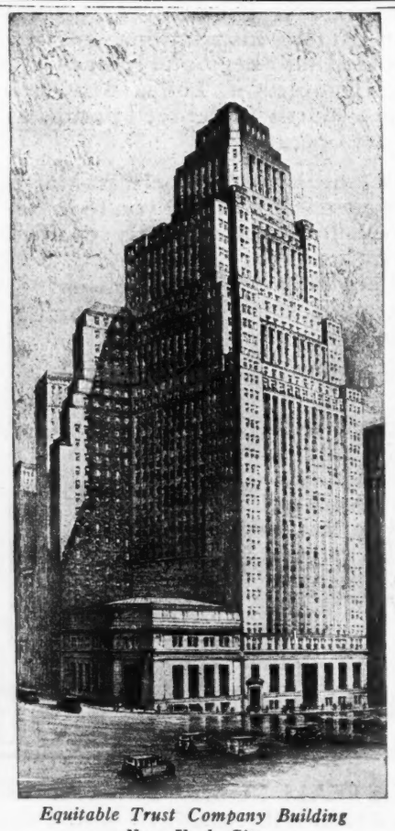

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—*Aesop's Fables*

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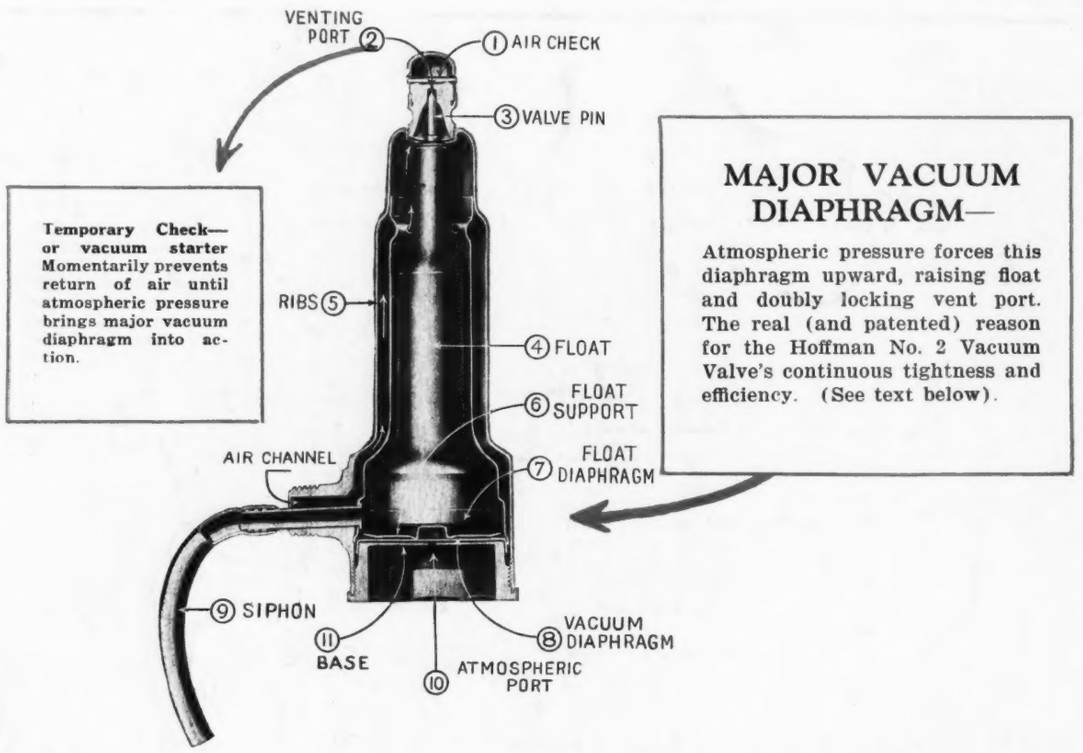
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(7) FLOAT DIAPHRAGM
(9) SIPHON
(11) BASE
(8) VACUUM DIAPHRAGM
(10) ATMOSPHERIC PORT

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an explanation of why they are vital to Vacuum Valve tightness

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That is why (in the Hoffman "Double Air Lock" method) the *temporary check or vacuum starter* is reinforced with a *major vacuum diaphragm* having *one whole square inch* of surface—exerting in all a pressure at least 20 times greater than any disc or ball check made—thus *insuring tightness under all conditions.*

That is why Hoffman No. 2 Vacuum Valves can be guaranteed for 5 years—and why they cut fuel bills 1/3. Hoffman Specialty Co., Inc., Dept. C-34, 25 West 45th Street, New York City.

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